'Our Energy Challenge': Ofgem's response

Date of Publication: 8 May 2006

Overview:

Ofgem welcomes the opportunity to re-affirm the benefits to consumers of independent network regulation and markets. Key recommendations are:

- We offer to provide longer term scenario analysis for networks and markets, to facilitate consumer awareness.
- We offer suggestions to address systemic risk and fuel poverty concerns.
- We provide ideas for funded long term carbon contracts to work alongside the EU ETS whilst agreement is reached over future phases of the scheme.
- The Government should consider actions to clarify nuclear activities, gas quality, and new technologies. In particular, Ofgem supports initiatives related to smart metering.

Contact name and details:
Andy MacFaul, Head of the Better Regulation Unit, Ofgem

Tel: 020 7901 7083
Email: andrew.macfaul@ofgem.gov.uk

Ofgem, 9 Millbank, London SW1P 3GE
www.ofgem.gov.uk

Table of Contents

Summary

Affordable, sustainable and reliable energy supplies are key objectives of the Government's energy policy. Customers have become more concerned with all three aspects of policy over recent years as energy prices have risen and interest in sustainable development has increased. Ofgem re-affirms its belief that markets, although not perfect, are the best way to meet these objectives and deliver secure and reliable supplies to consumers. With appropriate policy measures, the Government can harness the power of markets to make our energy supplies more sustainable and meet the carbon challenge. Recent events have caused many to call into question whether markets are the best way of delivering energy policy. The Energy Review provides the opportunity to tackle these concerns and offer further assistance in building confidence in markets.

Markets require information and we recommend that more work on forward-looking scenarios be carried out in relation to energy supplies and networks. This will provide more accessible analysis and reliable information for government, industry participants and consumers about possible future investment requirements and whether the market is investing to maintain reliable supplies.

Ofgem supports fully the EU Emissions Trading Scheme (EU ETS) as the preferred way ahead. However, we make suggestions for long term carbon contracts funded through auction revenues under the existing EU ETS. Such contracts could help the Government stay on track to meet its domestic carbon reduction goals and bridge the gap before a wider international agreement is reached and the next phase of the EU ETS is agreed. They could deliver more sustainable energy supplies and help to resolve some of the uncertainty that could be stalling potential developers of new power stations. The timetable for implementation of such a scheme may be largely dictated by the success of the EU ETS scheme beyond 2012.

We will continue to work in concert with government and industry to help tackle fuel poverty, in particular by expanding our facilitation role, and helping to promote a 'find and fix' approach. This remains central to our work given that energy prices are unlikely to return to the levels seen in the 1990s because of the need to invest in new, more sustainable sources of energy supply and in our energy networks.

Lessons should be learned from the gas supply situation in winter 2005/06 and the probability of further problems in 2006/07. Our recommendations build on these lessons and should provide benefits in both the short term and medium term.

As an energy regulator for the 21st century, we are committed to sustainable development. This is clearly in tune with the Energy Review and, in addition to a long term carbon trading scheme, Ofgem's response highlights:

- the publication of a new annual sustainability report;
- the current full scale review by Ofgem of innovative metering; and
- continuing action in networks regulation to facilitate the connection of new generation projects.

Ofgem's core work is the regulation of monopoly networks. In the recent electricity distribution networks price review and in the on-going transmission price reviews

Ofgem is seeking to ensure that the regulatory system is 'future-proof'. We propose supplementing this approach by working with the network operators to publish longer term scenario reports to inform the decisions of network users.

Ofgem appreciates that this Energy Review has a broader canvas – both EU and more global - and this is in tune with consumers' greater awareness of systemic or geopolitical risk to our energy supplies. Ofgem is fully committed to assisting any work that the Government thinks necessary to analyse and address these risks, including a holistic review of strategic energy reserves. But any review needs to look at all forms of storage (ie. coal as well as gas) and the potential for demand side response such as occurred this winter in the switch from gas to coal and distillate fuels by power stations and industry.

A national energy review is almost impossible to carry out in geographic isolation, either from future influences (European energy policy, global LNG markets) or from lessons learned in other markets (such as the events in Ontario's electricity market following the abandonment of a market-based approach). Our response addresses both, and in summary:

- we shall seek fully to support the Government in its leadership position within the EU on carbon issues and on energy markets. This is also a position we share with the Commission.
- we support the Government's views that a pan-European energy regulator is not appropriate currently, and are committed (for example, through Sir John Mogg's chairmanship of the EU regulators) to create the appropriate market climate so that a competitive market approach is seen as a positive force across Europe.

Much has been achieved in the last twenty years of energy markets in the UK. Competition and markets have delivered significant benefits to consumers, who have enjoyed greater choice and lower prices than most of Europe. In networks, thanks to effective, independent regulation, investment is higher, standards are higher and charges are much lower than before privatisation. In markets, huge investment of £14 billion has occurred in the electricity sector in building new, cleaner power stations and in reducing emissions from existing coal-fired power stations. Looking forward, the major investment of £10 billion in new gas import infrastructure will ensure that from 2007 the UK's gas infrastructure will have substantial capacity above peak demand.

In this changing energy world, both regulators and energy companies continue to evolve to meet consumers' needs. Our response, which contains recommendations for government to consider as well as actions we ourselves will take, highlights Ofgem's willingness and ability to meet this challenge, and reflects the fact that we are confident that we have the necessary powers to do so.

In our view the key challenges that lie with the Government arising from the Energy Review are clarity on nuclear licensing, planning and waste; further action on gas quality; and a focus on improving housing and incomes (and centralised government organisation of existing schemes) to help tackle fuel poverty.

1. Introduction and background

1.1. The Government's energy policy has four goals: reducing carbon emissions, maintaining reliable energy supplies, promoting competitive markets in the UK and beyond and ensuring that every home is affordably heated.

1.2. In this introductory chapter, we look at the role that energy markets and independent regulation of networks has played in helping to meet these policy goals. We look at whether Ofgem's current role and duties are still consistent with the Government's goals, and conclude that they are. We set out briefly our answers to the main questions in the Government's Energy Review consultation document.

1.3. Later on in the response, we comment in greater detail on many of the issues raised by the Review, notably:

- the role that effective, independent network regulation has played and will continue to play in delivering reliable and secure energy supplies;
- the role that markets have played and will play in delivering reliable, secure energy supplies;
- the role that energy markets can play in helping to reduce carbon emissions;
- the further steps that government might take to tackle fuel poverty.

Background

1.4. Over the twenty years following privatisation the current energy policy framework combining competitive energy markets and effective, independent regulation has been successful in meeting the Government's goals. Carbon and other emissions were reduced as cleaner, more efficient gas-fired generation replaced coal generation and investment was made to reduce emissions from remaining coal-fired plant. Fuel poverty decreased as energy prices and regulated network charges fell as efficiency improved. Security and diversity of supply increased through significant investment: over £80bn was invested in new oil and gas production from the North Sea; over £30bn in gas and electricity networks and £14bn in new electricity generation stations and in refurbishing coal fired stations to create a more diverse generating mix. Business and domestic customers have enjoyed some of the lowest energy prices in Europe together with improved service and choice.

1.5. But recent experience has led to challenge as to whether we can continue to rely on a policy based on energy markets. Wholesale and retail gas and electricity prices have risen significantly and remain high and volatile, impacting on industrial competitiveness and fuel poverty. Carbon emissions have started to rise as generators have increased output from their coal-fired stations in response to rising gas prices. The recent decline in production of North Sea gas has also prompted questions about whether the market invested quickly enough to make new gas import infrastructure available and about how much we can rely on imported gas to provide secure energy supplies. Against the background of security of supply concerns in gas this winter and next, concerns have been expressed about whether we have either enough or the right mix of gas storage to deal with short term supply shocks, given the decline of North Sea supplies. There are a number of important

current initiatives to encourage competition in European energy markets, but until now progress in liberalising EU energy markets has also been slow, with a significant impact on imported gas supplies to the UK, energy prices and domestic and business customers.

1.6. So, looking forward, can we continue to rely on a policy based on competitive markets and independent regulation of networks to deliver the Government's energy policy and what, if any, changes need to be made? Our view is clear. We are able to rely on the current arrangements to provide secure, diverse and reliable energy supplies even in a world where we are no longer self-sufficient in gas.

The Authority's role and duties

1.7. Our principal objective is to protect the interests of gas and electricity consumers (both present and future), where appropriate by promoting competition. We do this by making markets work for domestic and business energy customers and through the effective regulation of monopoly network businesses. We also have a range of important secondary duties, including promoting security of supply, having regard to the environment and sustainable development and paying particular attention to the needs of vulnerable energy consumers. We are also committed to better regulation, consistent with our secondary duties, which involves regulating only where necessary and operating transparently and firmly within our statutory remit for the benefit of consumers and business.

1.8. Our functions and duties have changed since Ofgem and its predecessor organisations were created to reflect changes in government policy objectives and emerging new challenges such as climate change. Our approach has evolved to reflect these changing duties and functions and we are now much more focussed on sustainable development and security of supply when using our powers and taking decisions. Our recent decision to look at smarter forms of metering is evidence of this.

1.9. We think that our duties and functions are fully consistent with government policy objectives. However, we should all acknowledge that the objectives themselves are sometimes competing – security of supply, fuel poverty, promoting competitiveness and reducing carbon. In our view, the primacy of the consumer, present and future, and other duties are correct. Our current powers of enforcement are appropriate and provide us with the tools we need to carry out our existing functions and duties effectively. We also think that the social and environmental guidance, requiring decisions involving significant costs to consumers or business to be made by government, and not Ofgem, sets appropriate parameters for our work.

Ofgem's response to the main questions of the review

The Government asks five key questions and invites comments on four issues described in the consultation documents. We respond to the five questions and to two of the other issues (concerning network investment and working with other countries) and develop these ideas further within the document.

Q1. What more could the Government do on the demand or supply side for energy to ensure that the UK's long term goal of reducing carbon emissions is met?

On the supply side, the EU ETS provides an excellent foundation. The government should continue to push for the expansion of the scheme to cover other major carbon emitting sectors and do all it can to provide greater certainty over carbon targets beyond 2012. Subsequent phases need to be longer than five years to improve their alignment with investment timescales in the energy industry. But this is likely to take time as it will require international agreement and negotiations with the EU and Kyoto signatories. Given this uncertainty, the government could consider introducing long term carbon emission reduction contracts to continue on a path to meeting its emissions targets during this period. (See pages 26 to 27 for more details.)

Many have drawn attention to the barriers on the supply side: the Government should continue its scrutiny of them. The planning process can delay new investment in sources of supply and storage, causing specific problems for certain low carbon technologies such as wind turbines and nuclear generation. It may also significantly delay investment in new transmission infrastructure to connect new sources of supply to customers. Balancing the need for appropriate democratic processes, planning approval needs to be as clear, transparent, quick and predictable as possible.

On the demand side, the EU ETS is already having an impact on energy prices. Business and domestic customers will, over time, respond to higher prices that include the cost of carbon and will look at ways of being more energy efficient including looking at using technologies such as microgeneration. Ofgem has set up a forum to assist in this debate and plans to showcase the issue in one of its 'Powering the Energy Debate' seminars later this year.

There is likely to be an increasingly important role for smarter metering in helping customers to improve their energy efficiency. We have a major project underway to try to unlock this potential and we shall be reporting our conclusions shortly following an external review. This will build upon the recent announcement by the Government to fund a trial of smart metering.

Q2. With the UK becoming a net energy importer and big investments to be made in the next 20 years in generating capacity and networks, what further steps, if any, should the government take to develop our market framework for delivering reliable energy supplies?

Despite recent concerns about high and volatile energy prices and security of supply, the Government should not make any significant changes to the existing market and regulatory framework.

The level of investment required to replace and expand our ageing networks and to provide new and more sustainable supplies is significant but is not unprecedented. Companies have already invested over £44bn over the last 15 years in replacing and renewing our energy infrastructure. The market is investing over £10bn in gas import infrastructure and projects that will double the UK's gas storage capacity. We are currently considering proposals from the companies to invest over £7bn in our

transmission networks. Markets value diversity in sources of supply and are unlikely to invest solely in gas as existing generating stations close. Electricity generators have recently announced plans to invest to extend the life of a further 9GW of our existing coal fired plant through the fitting of FGD equipment, bringing the total to nearly 19GW or 25% of our current generating capacity. Companies are now signalling a willingness to invest in a range of generating technologies including renewables, gas, clean coal and nuclear as existing stations are retired. This is partly in response to changing fuel prices but also to meeting the challenge of lowering emissions.

Apart from investment, confidence in markets is created by evidence that the regulator is on the one hand actively monitoring for abuse, while on the other hand is assisting the provision of tools which create orderly markets. Ofgem has a proven track record in both areas (in the last two years alone there have been two inquiries into aspects of the wholesale gas market and initiatives to assist transparency of information) and we will continue to fulfil these duties actively. There are however lessons to be learnt and stronger, forward looking analysis needs to be developed given the impact on prices and the damage to customers if this investment is not made quickly enough. Supply margins and network investment must be under constant scrutiny to make sure that there are no barriers to competition or investment.

One area for further government action is the issue of gas quality. Our existing gas quality specifications do not match those on continental Europe and this could restrict the availability of gas supplies to the UK in future. The government has recently consulted on proposals to tackle this issue. This needs to be resolved as quickly as possible.

Q3. The Energy White Paper left open the option of nuclear new build. Are there particular considerations that should apply to nuclear as the government re-examines the issues bearing on new build, including long term liabilities and waste management? If so, what are these, and how should the government address them?

Nuclear generation faces more uncertainty than other generation technologies because of the lack of clarity surrounding the licensing of new nuclear reactor designs as well as the management of nuclear waste.

The Government should put in place clear arrangements for licensing of new nuclear designs, should review the planning process for new nuclear stations, and should provide a clear framework for managing nuclear waste and decommissioning. Once these are in place, companies will be able to take commercial decisions on the attractiveness of investing in new nuclear build rather than other competing low carbon technologies such as renewables, clean coal and gas. Companies are now signalling that they think nuclear is commercially viable and are willing to invest in new nuclear plant if these issues are addressed.

It should also be recognised that connection of new nuclear plant at existing sites could involve very substantial investment in reinforcement of the transmission network if the new plant is on a larger scale than the plant it would replace. Our proposals for dealing with questions of access to the transmission system and related

network reinforcement are considered in chapter 2. Our intention is that the regulatory structure should be able to respond to any new investment requirement whether it is triggered by new nuclear, renewable or conventional generation.

Q4. Are there particular considerations that should apply to carbon abatement and other low carbon technologies?

The most important step is to provide greater long term certainty on carbon targets under the EU ETS and to seek to widen the scheme to include all major emitting sectors. The energy sector has an important role to play in helping to lower carbon emissions through greater energy efficiency and lowering emissions from generating and transporting energy but other sectors must also have the right incentives to cut emissions.

Q5. What further steps should be taken towards meeting the Government's goals for ensuring that every home is adequately and affordably heated?

Prices for energy are unlikely to fall back to the levels seen in the 1990s given the investment required in new low carbon sources of energy supplies and in renewing and expanding our energy networks. More resources are needed to address the problem of fuel poverty. This funding should come from government and should be focussed on improved incomes and housing, not social tariffs. Further thought also needs to be given to the best means of delivering this help to ensure that comprehensive solutions are provided and that help is targeted where it is needed most.

Two of the four issues raised in the Energy Review are of direct relevance for Ofgem.

Issue ii. Implications in the medium and long term for the transmission and distribution networks of significant new build in gas and electricity generation infrastructure.

Significant new build in gas and electricity generation infrastructure is likely to require substantial new investment in the networks, both to connect these projects and to reinforce the existing networks to handle new patterns of flow. The networks also face technical challenges, such as dealing with intermittent forms of generation and the potential significant penetration of smaller scale microgeneration, as well as an increasing need to renew and replace existing assets.

Our approach to network regulation is evolving to meet these challenges. Our recent price controls for the electricity distribution companies allowed a significant increase in investment and had a range of new incentives to promote innovation and to connect local, distributed generation. In electricity transmission we have approved significant investment funding to provide capacity for renewable generation connections in Scotland. Looking forward, we are currently developing proposals for the gas and electricity transmission companies to provide them with funding and appropriate incentives for investment in asset renewal and for expansion and reinforcement of the networks to connect new sources of supply. Our aim is to make the regulatory mechanism sufficiently flexible to respond quickly and effectively to any demonstrated need for new capacity.

Issue iii. Opportunities for more joint working with other countries on our energy policy goals

Since the last Energy Review, energy policy has moved up the policy agenda of the European Commission and the EU. There is clear evidence of this from a range of initiatives: the Commission's recent Green Paper on Energy Policy and its enforcement action against Member States for failure to implement various Energy Directives; sector inquiries into the gas and electricity markets and the establishment of the High Level Group to look at energy and competitiveness.

The Government must remain active in influencing and shaping the debate alongside its evolving UK energy policy. As our own energy reserves decline, our markets and prices are increasingly linked to European energy markets. It is crucial to drive the liberalisation agenda forward and to ensure that European energy policy continues to be based around energy markets and effective independent regulation of these markets and associated networks.

Ofgem is committed to playing an active supporting role with the Government to achieve this by bringing our detailed knowledge and expertise to bear on these issues. We can use our extensive experience of the benefits of greater transparency to achieve a comparable situation in European energy markets. The Commission's report has highlighted the problems and costs to customers. On the liberalisation agenda we can do this through our Chairman's role as president and chairman of the Council of European Energy Regulators (CEER) and the European Gas and Electricity Regulators' Group (ERGEG), as well as the gas and electricity regional initiatives, and our cooperation with DG Competition on its sectoral reviews. Through ERGEG we will provide detailed advice on integrating the development and operation of the gas and electricity networks so that they operate effectively as a 'European grid'. We will develop an appropriate framework for efficient investment in essential infrastructure, particularly for cross-border investments (including transit), where there is a 'regulatory gap'. We should also help in developing the infrastructure to bring gas to the EU from non-EU producing countries

2. Networks and security of supply

Summary

2.1. Britain's electricity and gas networks today are more reliable and more efficient than ever before. Our approach to network regulation has delivered increased investment, improved customer service and lower charges. Network regulation continues to evolve to address new challenges and lessons learned from previous periods.

2.2. We have identified a number of actions we can take to contribute to the Government's energy policy goals, consistent with our statutory duties:

- we support abolition of Final Sums Liability in its current form, and its replacement with an alternative which acts as less of a barrier to connection of renewable generation;
- we will address the 'GB queue' to try to find ways to advance connection timescales for generators whose plans are most advanced and, more generally, seek to provide clearer and shorter timescales for connection of new generation, potentially including review of interpretation of network security standards;
- we will continue to drive further improvements in network reliability where these represent value for money;
- more generally, we will continue to press the network operators to evolve the regulatory and commercial regime to meet the needs of existing and prospective network users; and
- if supported by the outcome of the Energy Review consultation, we will work with the network operators to draw together and publish longer-term scenarios for network developments, without duplicating the statements currently published but reflecting perspectives on broader and longer term trends.

Background

2.3. We concur with the Government's assessment in the Energy Review that Britain's electricity and gas networks have an excellent record since privatisation: reliability and customer service have improved while charges have been reduced substantially.

2.4. The operation of electricity and gas networks is naturally a monopoly function – in general, it would not be economic to have multiple operators competing to provide networks to serve existing customers. Economic regulation is therefore necessary to ensure customers get good value for money from the network operators. However, we seek to replicate the influences of markets through comparative regulation and the use of financial incentives.

2.5. Ofgem's role is to protect the interests of consumers, having regard to the need, among other things, to secure that all reasonable demands for energy are met and that licence holders are able to finance the activities they are required to undertake.

2.6. The licensed network operators are required to develop and maintain an efficient, coordinated and economical system; to facilitate competition in supply and generation; and to connect new users.

Achievements of network regulation

2.7. Ofgem protects the interests of network customers through a range of licence conditions, most prominently through price controls (known as 'RPI-X'). Typically set every 5 years, price controls determine the amount of money that network companies are allowed to charge. This generally comprises two components. The largest is an assessment of finance required to meet operating expenditure, capital expenditure, and returns on capital employed. The smaller, more variable, component relates to incentives to deliver specific outputs to ensure that network users get the service they need at best value.

2.8. The RPI-X approach has been very successful in encouraging efficiency, thereby reducing charges substantially in real terms:

- Electricity distribution - 50% reduction since 1990
- Electricity transmission - 41% reduction since 1990
- Gas transportation - 41% reduction since 1994.

2.9. Under RPI-X, investment has been higher than in the period before privatisation. Network reliability is high and customers are getting better service now than ever before. The electricity transmission network was 99.9997% reliable last year and the electricity distribution networks have delivered 16% improvements in reliability since new incentives were introduced in 2002. Interruptions are less of an issue on gas networks where the level of unplanned interruptions is extremely low.

2.10. Since the Energy White Paper, the security of energy networks has also been improved through measures to make the sector more resilient to financial distress. Most notably, government has introduced special energy administration provisions through the Energy Act 2004. Ofgem has also extended financial ring-fence licence conditions to independent gas and electricity distributors.

2.11. Networks today are more reliable, more efficient, subject to more investment and more accessible to users.

Regulatory evolution

2.12. The form of network regulation employed today is substantially different from the form of RPI-X utilised in the late 1980s and 1990s. In particular, it has evolved to provide incentives for improvement in customer service and a more sophisticated approach to the regulation of investment.

2.13. Investment needs are driven by two main factors:

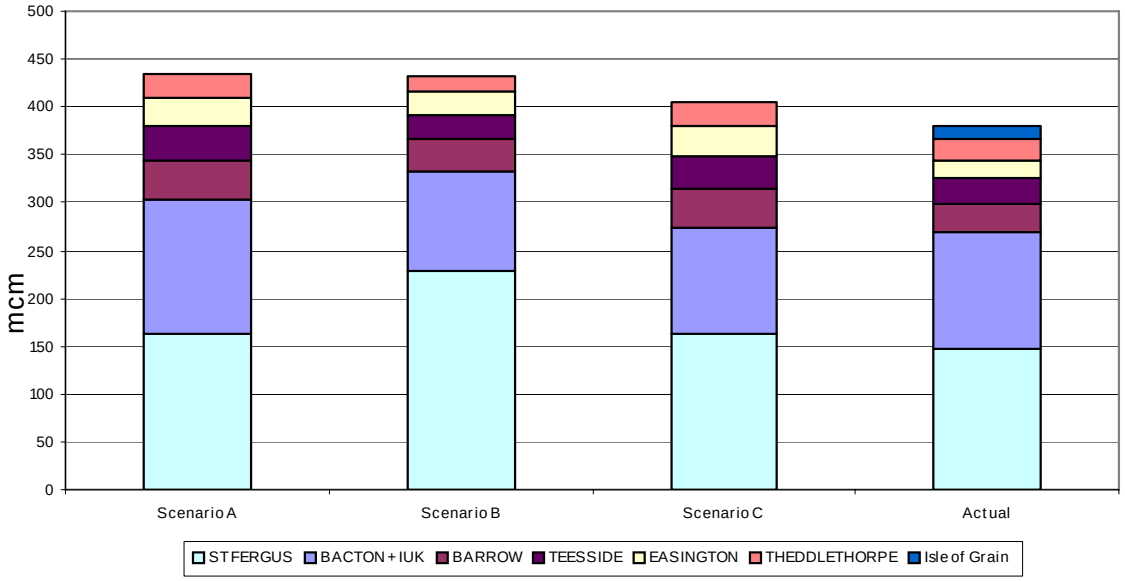
- the need to replace ageing assets as they wear out; and
- the need to reconfigure the networks in response to changing user requirements.

2.14. The price controls we set are already responding to an increasing need for asset replacement. For example, we provided a 48% increase in capital expenditure allowance for electricity distribution in 2005-2010 and agreed funding for the accelerated mains replacement programme for gas distribution. The need for asset replacement is likely to continue to be an important factor in future reviews.

2.15. Responding to changing patterns of supply and demand, including network extension, presents particular challenges for the network companies and hence for their regulation. Price controls must be – and are - sufficiently flexible to respond to these needs. For example, following shortages of entry capacity for producers landing gas at St Fergus in 1998, Ofgem introduced a new system to make gas transmission more responsive to user needs. This uses auctions to allocate existing capacity efficiently between users and, subject to certain tests, to oblige the transmission company to provide additional capacity by a fixed date (normally 3 years). The provision of firm rights on a fixed timetable, which this approach provides, has been important in attracting new gas infrastructure to the UK.

2.16. Figure 2.1 shows that actual gas flow through St Fergus has been lower than the scenarios put forward at the 2002 price control review. The longer-term auctions have subsequently demonstrated that the need for capacity at St Fergus is expected to decline further, while additional capacity will be required at Milford Haven and Easington. These signals have led to significant redirection of investment to the locations where it will be required, rather than where it was predicted several years ago.

Figure 2.1: Transco's 2002 price control scenarios for gas entry flows in 2005/06 compared to actual flows, by entry point



Source: Ofgem, using information provided by National Grid

2.17. In the current transmission price control we are seeking to introduce similar principles for entry to the electricity transmission system and offtake from gas transmission.

2.18. The 2003 Energy White Paper set a number of challenges for network operators and network regulation. As part of the 2004 Electricity Distribution Price Control Review, we responded by introducing incentives on distribution companies to connect and utilise distributed generation efficiently, including incentives to employ innovative solutions and to engage in the development of new technologies and approaches. These initiatives have been widely welcomed. We also significantly strengthened incentives to reduce losses, partly to reflect the carbon cost of network losses.

2.19. On the transmission network, the existing price controls were set in 2000 and 2001 and made no allowance for investment in support of renewables. In 2004, Ofgem therefore introduced specific measures ('Transmission Investment for Renewable Generation') to allow projects to go ahead without unnecessary delay. Major expansions of capacity were approved for the Beauly-Denny, Scotland-England interconnector, Kendoon and Sloy projects – involving some £560m of investment. The constraint on progress of these projects, particularly Beauly-Denny, lies in obtaining planning consents, not price control funding.

2.20. Inevitably, price control regulation is only one tool (albeit a vital one) for influencing the behaviour of network companies. This is one of the key balancing acts for regulation – to influence the outcomes without taking over responsibility for the inputs, continuing to leave decisions to company management as far as possible. Overall this has worked well, but allowing the various management teams to create their own solutions (in some cases in competition by comparison with their peers) inevitably means that some will proceed faster than others.

2.21. Achieving the necessary evolution in regulation while maintaining the confidence of investors in the sector and hence continuing to attract capital at reasonable value is another balancing act. We continue to work to improve predictability for investors financing expenditure on networks – both within our current approach and by carefully assessing suggestions of others – wherever this will benefit consumers. Ofgem's achievement of this task is greatly aided by the clear understanding of its independence and the general stability of the statutory framework in which it operates.

2.22. It has been suggested that the five-year framework for price controls is incompatible with long-term investment planning. We do not agree. Indeed, if price controls were set for periods much longer than five years, consideration of the challenges posed by the White Paper may still be on hold or may have needed major re-opening of the price controls. Re-opening a price control mid-period involves uncertainty for companies, consumers and providers of finance and would risk damaging incentives. One of the advantages of the five year review timescale is that it permits the regulatory framework to develop flexibly to meet the challenges of changing circumstances, without (or with only limited) need for re-opening reviews. This does not mean that regulation is bounded purely by a five year timescale. Decisions in each review are taken in the context of long term views on network development and investment needs.

Challenges ahead

2.23. There are a number of challenges we are now addressing. For example, the transmission companies are now proposing major increases in investment - £6.5bn over the period 2007-12, an increase of 155% on current expenditure. We have acknowledged that increased investment is required but we need to ensure that the proposals are needed now and represent value for money.

2.24. Much of the investment in transmission networks will be driven by decisions made by users of the network – in particular, new electricity generators, gas importers and gas storage schemes. These decisions may, in turn, be affected by the outcome of the Energy Review.

2.25. It is important, for both users and consumers, that network investment is delivered efficiently when it is needed but it is inevitably difficult to forecast. As part of the current transmission review, we are therefore seeking to ensure that the regulatory system is future-proof. It needs to be sufficiently flexible to respond to users' requirements but also sufficiently robust to remain effective over the 5-year price control period without requiring us to intervene directly, other than in exceptional circumstances. This will involve the use of 'revenue drivers' as automatic adjusters to provide funding in response to users' decisions.

2.26. The existing arrangements for connection of new generators to the electricity transmission system worked well for most of the period since privatisation. However, the introduction of the BETTA reforms brought forward large numbers of connection applications (amounting to about 14 GW, and known as the 'GB Queue') which would otherwise have appeared over several years and this has led to some difficulties. At present, the electricity licensees provide access on a first come, first served basis and require users to guarantee the full cost of new network assets during construction, including the costs of deeper system reinforcement (known as 'Final Sums Liabilities'). This approach has failed to provide a mechanism to prioritise projects and is seen by many as a barrier to entry.

2.27. These are not simple issues but they are actively being addressed in connection with the current transmission price control review. In a recent consultation document we set out our view of features which should be part of any proposed solution. These are likely to involve:

- clear definition of the access rights that users will receive;
- requiring all users to make some commitment regarding their future use of the network to encourage efficient use of existing capacity and to provide clear signals for investment;
- facilitating timely connection of users; and
- reducing the burden on new users to guarantee the full cost of new network infrastructure while providing some protection to consumers against the risk of unnecessary investment.

2.28. We will be working with industry and government over the coming months to facilitate the development of the necessary reforms. Some of the issues around generation connections are potentially exacerbated by the interpretation of the security and technical standards. Network operators – both transmission and

distribution - will need to be more flexible, facilitating more economic solutions and enabling faster, although possibly less secure, connections at lower cost to developers.

2.29. In time, further increases in smaller, distributed or decentralised generation are likely to require technical (as well as commercial) active management by the distribution companies. As noted above, the last distribution review began the process of providing the companies with commercial incentives to meet these challenges through innovation. We are now working with the companies to develop commercial and charging arrangements to facilitate these changes. It is likely that the next price review will need to sharpen incentives in these areas to continue to change the approach of the network companies. Further structural separation between network monopolies and competitive sectors may be warranted in future.

2.30. As part of the ongoing gas distribution price review, we will assess whether the regulatory framework should do more to facilitate network extensions, which in some circumstances can help to reduce fuel poverty.

2.31. Although our approach is to accept that future user requirements are uncertain and to make the regulatory regime as flexible and responsive as possible, we are aware that various interested parties are calling for publication of long term scenarios of network development. Each of the network sectors already publishes seven or ten year projections and longer-term forecasts will inevitably be uncertain. Nonetheless, Ofgem is willing to play a role in publishing reports which would set out long term perspectives on the network sectors based on the views of the companies themselves and on our own analysis. An appropriate approach might be to publish such a report on each sector in advance of the 5-yearly price control review.

2.32. Action is required within the EU to ensure that European networks serve the needs of all European consumers and not just national needs. For example, many Member States, now including the UK, rely on the networks of other Member States for supplies of piped gas. At present investment in new cross border and transit infrastructure to meet these needs is not addressed in the current European regulatory framework - there is a 'regulatory gap'. Clarity is also needed in the framework to be applied to the investments needed to bring gas to the EU from producer countries to ensure that sufficient certainty exists to enable companies to make these essential investments.

3. Markets and security of supply

Summary

3.1. The UK is the third largest natural gas market in the world. The decline of the UKCS inevitably presented a major challenge for Great Britain's liberalised gas market. The market is responding and by 2010 we will have a diverse and flexible gas supply portfolio with access to gas from a range of countries and a significant increase in our storage capacity. This suggests that, with high levels of confidence we believe that over the longer term, the market will deliver security of supply. Given the lead times for planning and building new investment there is no need for further government intervention to provide incentives to deliver more import capacity.

3.2. However, investment in new gas supplies has been delayed leading to high prices this winter and, most likely, next. This is primarily the result of genuine uncertainties about the speed and extent of decline in North Sea gas supplies and the current lack of transparency about the availability of supplies from the rest of Europe.

3.3. In the electricity market, companies have a strong track record in investing to provide a secure and diverse generation mix. There is strong evidence to suggest they will continue to do so. There is also encouraging evidence that they will invest in new, low carbon technologies to help the government meet its carbon targets.

3.4. A lesson for electricity comes from recent experience in the gas market, which highlights the real problems that customers face in the shorter term when new investment is delayed. Recently security of supply has been maintained, on a few occasions, through significant demand side response from large customers. This has been associated with very high and volatile gas and electricity prices. The Government and Ofgem should continue to monitor, very closely, both investment and the supply demand balance in the UK gas and electricity markets going forward to make sure that energy markets are bringing forward investment when it is required. Ofgem suggests that the Joint Energy Security of Supply Group (JESS) report be reviewed to ensure that it meets the longer term needs of industry participants going forward.

3.5. In the light of increased geo-political (or systemic) risk the Government may want to review the workings of the energy market. Ofgem would be willing to be an active participant in any such review, and our suggestion would be to make any such review holistic and wide ranging.

What is security of supply?

3.6. Security of supply is about electricity and gas customers not being subject to involuntary interruptions. Customers do not all place the same value on the security of their energy supplies. Some business customers choose to have interruptible gas supplies and have back-up fuel available if their supplies are interrupted. But most domestic customers and many business customers would prefer not to have their

energy supplies interrupted for significant periods of time. They attach a relatively high value to having a secure supply of electricity and gas.

3.7. Secure energy supplies depend on three things. First, that there are sufficient supplies of electricity and gas available to meet customers' demand at all times, including peak periods. Second, that there is capacity on energy transmission and distribution networks to transport supplies from producers to customers. Third, that energy networks are reliable so that network capacity is available. This chapter focuses on the role of markets. The previous chapter set out the role of networks in delivering secure, reliable supplies.

3.8. Many customers will also consider price as important when assessing whether their energy supplies are secure. Even if their physical supplies are maintained they may see supplies as less secure if prices are high and volatile – as is currently the case in the gas market. Markets provide tools to help customers manage these concerns. Larger industrial customers have always had access to a range of contracts that allow them to fix their prices or limit their exposure to the short term price movements that may be required to bring supply and demand into balance. Suppliers now offer fixed and capped price deals to domestic and smaller business customers who can choose to protect themselves against price volatility.

3.9. When assessing whether there are adequate supplies to maintain security of supply, there are two helpful concepts to consider:

- **Diversity.** Generally speaking, energy supplies are more secure if they are more diverse. In electricity markets diversity is measured by looking at the different types of fuels used to generate electricity and their sources. In gas markets, diversity can be measured by looking at the number of countries supplying imports and the number of different pipelines and production facilities that supply demand at different times of the year;
- **Flexibility.** Gas and electricity markets need flexibility for two reasons: to meet the short term peak requirements of customers (daily winter peaks in gas and peaks for a few hours each day in winter in electricity) and to meet sudden unexpected breakdowns in key electricity or gas production facilities without interrupting customers.

Will markets deliver security of supply?

3.10. Electricity and gas markets are, in many respects, no different to other markets for goods and services that successfully deliver their products to customers in a reliable and secure way. But, like any market, these markets can only successfully deliver security of supply if there are not external constraints on their operation. The construction of major new energy infrastructure typically requires various licences and permits. For energy markets to operate effectively, the processes for issuing licences and permits need, as far as possible, to be transparent and well-defined with clear timetables for receiving a decision.

3.11. Over the last twenty years, the planning process in the UK has delayed the development of a number of gas and electricity infrastructure projects. Although the government has tried to address these issues, the planning regime can still delay new infrastructure. The major impacts have been on the development of wind

farms, onshore gas storage facilities and major electricity transmission and gas transportation investments. In future, it could impact on new nuclear build.[1]

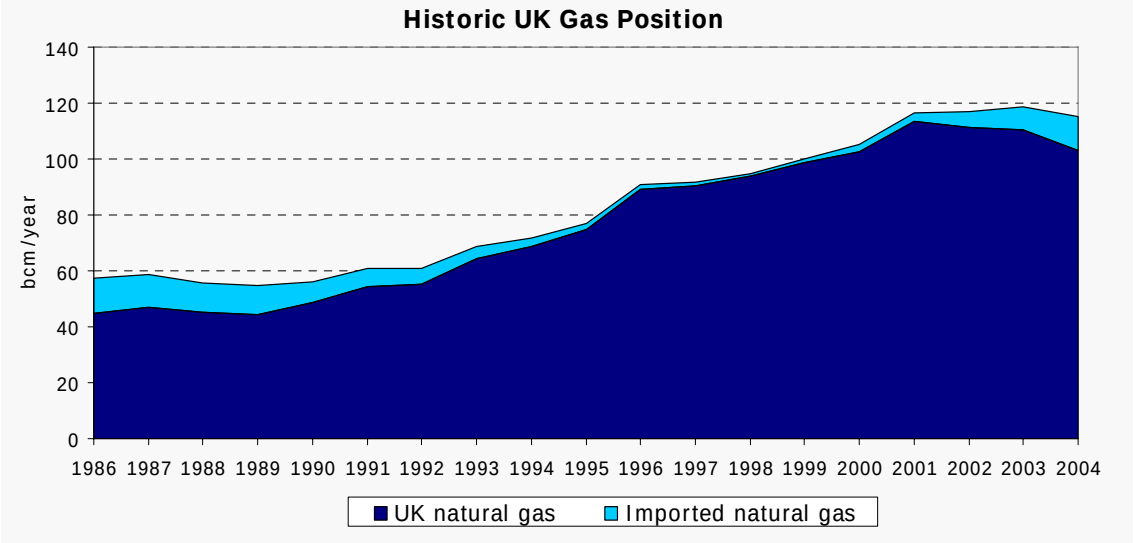
3.12. Clearly it will remain important for the Government and Ofgem to monitor investment and the supply/demand balance to make sure that the energy markets are bringing forward projects in a timely way. The JESS Group, which produces regular published reports, provides an appropriate mechanism for keeping the situation under review.

Gas[2]

Security of supply to date

3.13. Figure 3.1 shows that since 1996, when major investment in the order of £82 billion occurred in offshore gas field development and exploration of the United Kingdom Continental Shelf (UKCS), the UK has been largely self-sufficient for its gas supplies, although we have imported gas from Norway for many years .[3] This investment has been led by the private sector since the privatisation of British Gas and has provided high levels of security of supply. Supplies were highly diverse with over 590 gas producing fields in the North Sea. Supplies were also highly flexible through a combination of investments, in large, flexible 'swing' fields such as Morecambe Bay and the Sean fields and investments in gas storage at Rough, Hornsea, Hole House Farm, Hatfield Moor and Humbly Grove.

Figure 3:1: UK import dependency



DUKES - Digest of UK energy statistics - DTI publication

[1] There are currently in excess of 50 energy related projects in the planning stages that, if built, would equate to 2.3bcm of new storage capacity and 9 GW of generating capacity. Source: National Grid Ten Year Statement [Gas] and Seven Year Statement [Electricity], 2005.
[2] Detail behind the information in this section can be found in Appendix Two.
[3] We define self-sufficiency strictly by reference to the balance between exports and imports. Exports began to exceed imports in 1996 (DTI, *UK Trade in Natural Gas* (Dec. 2001), p. 26, Chart I) and imports did not exceed exports again on a sustained basis until 2004 (DTI, *Energy Trends* (Dec. 2005), p. 13, Chart 4.2).

Security of supply in the future

3.14. Production from the North Sea is now in decline. The market has responded by announcing plans to invest over £10bn in new gas import infrastructure. This will provide capacity to supply 94 bcm of gas by 2010, equivalent to 87% of forecast UK demand.

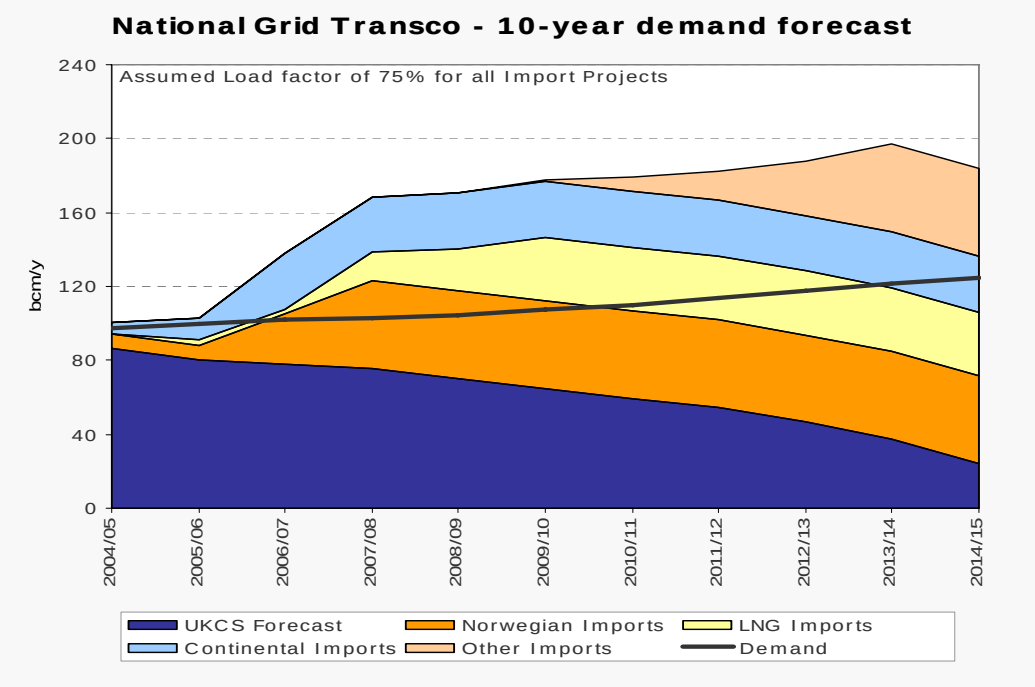
3.15. The major projects include:

- increasing the import capacity of the Bacton-Zeebrugge interconnector, which was originally used primarily to export gas to the continent, has been expanded once and will be expanded again later this year;
- two new import pipelines (one from the Netherlands and the other from the Norwegian shelf) are under construction; and
- one LNG import terminal is up and running and two more are scheduled to come on line in 2007/08. In addition, an LNG import facility utilising LNG regasification on board a ship has been announced for winter 2006/07. Finally, four further terminals and an upgrade to the existing terminal are also planned by 2011.

Together, these projects will add a further 255mcm/day to gas import capacity to the UK by 2010. This is equivalent to 49% of peak demand during a very cold (1-in-50) winter. A significant proportion of this new infrastructure is backed by long term gas supply contracts. What this means in practice is that we could have a serious supply shock (such as the recent fire at the Rough storage facility) and still have sufficient gas to meet the gas demand of domestic, industrial and commercial customers.

3.16. By 2010, our gas supplies will come from a very diverse range of sources, including the North Sea, the Netherlands, Norway, Qatar, Algeria, Trinidad and Tobago, Oman, Egypt and Russia.

Figure 3:2: Source of UK gas supplies 2010



Source: NG TYS 2005

3.17. LNG imports are likely to be a significant source of Great Britain's gas supplies by 2010. This should also increase diversity and flexibility as the global market for LNG develops. UK supplies will only represent about 10% of world LNG sales. A deep and liquid global LNG market could provide us with a diverse and flexible market to source additional gas in the event of significant shocks to UK gas supplies

Gas storage and flexibility

3.18. Historically, UK gas supplies have been highly flexible and diverse. A suitable comparison would be with the Netherlands, a country with plentiful indigenous gas supplies, which has just 5 per cent storage facilities versus annual volumes used, versus the UK with 3.5 per cent. We have therefore required less storage capacity than other European countries that have been more reliant on imports. But comparisons of our existing gas storage capacity with other countries can still be misleading. Unlike in many other European countries, gas-fired power stations account for a significant proportion (approximately 30%) of annual UK gas demand. As has been seen this winter, many of these stations are able to switch to distillate fuels and to reduce their gas demand. These distillate stocks are another source of storage for the UK gas market. Our coal-fired generation fleet also provides a further source of gas storage as they can be run instead of gas-fired power stations.

This winter gas-fired power stations have provided over 40mcm/day of additional gas supplies by switching to coal or distillate. This provides storage deliverability equivalent to the Rough storage facility.

3.19. As the North Sea declines and we become more reliant on less flexible imports our requirements for gas storage capacity will increase. The market is addressing this natural decline in flexibility by investing in gas storage: three new storage facilities have been completed since 2002 and a further 11 sites are planned by 2010.[4]

By 2010, investment by the market should see a doubling of storage capacity and the ability to provide 66% of the forecast peak demand during a very cold winter.

3.20. Currently we have much less physical gas storage than Germany measured either by total storage stocks (volume) or the rate at which it can be used (deliverability). For example, Germany has storage capacity of 17bcm versus the UK's 3.5bcm. But this simple analysis misses two key points. First we have significantly more storage available through our ability to switch from gas-fired generation to coal and to use distillate instead of gas. This increases our effective storage by nearly 40%. Secondly, due to the North Sea supplies, historically we have needed less storage. By contrast, Germany is both dependent on gas imports and supplied by a few very large import pipelines. Its largest credible loss from a single source of supply, if one of these pipes were to fail, is almost twice the level of the GB market. The German market therefore needs more storage than the GB market to insure against this risk. But as we become more reliant on imports, this picture will change. The market is responding to this and is investing in more physical and distillate storage to manage the greater risks associated with loss of import infrastructure.

3.21. As we become more dependent on imports, some commentators have suggested that the government should consider intervention to provide strategic storage stocks. These stocks could be used to manage the risks and high prices that would result from significant supply shocks. In Appendix three, we have set out an initial assessment of the case for strategic storage as the UK becomes more import dependent. Our initial analysis suggests that strategic stocks would not represent good value for money for customers given the significant investment already planned by the market and the effective storage provided by switching to alternate fuels. There are risks in even considering the case for strategic storage. Indeed, the prospect of intervention may delay much needed investment in new storage facilities or raise the cost of financing these facilities by raising the risk to investors. Investment in strategic stocks could also substitute for planned investment by the market and not lead to any overall reduction in risk.

3.22. Even still, we acknowledge that a review of storage facilities may form part of a broader analysis of systemic risks posed to the energy sector. Indeed, consumers are highly aware of the geo-political risks. Ofgem would want to play an active role if any such review is sought by the Government.

[4] See Table 1.7 in Appendix 2 - Supporting Data.

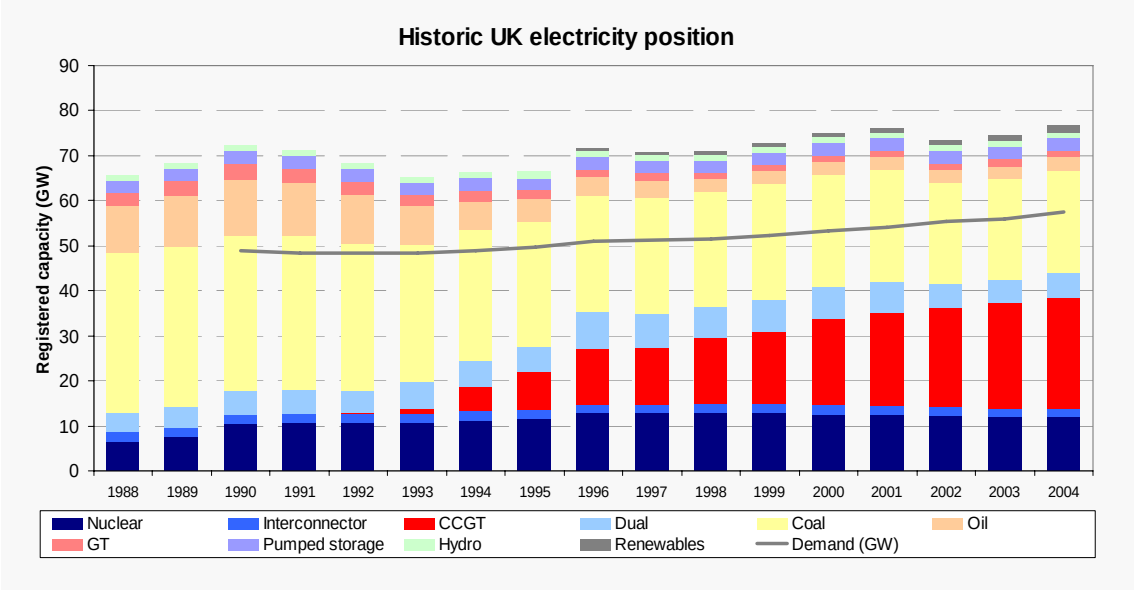
Electricity[5]

Security of supply to date

3.23. At the time the electricity market was liberalised in 1990, there was little diversity of supply: it was essentially coal-fired and nuclear. There were no gas-fired power stations because this was prohibited under an EU Directive. The removal of this prohibition, falling gas prices and improvements in the efficiency of gas-fired plants led to a surge of investment in such plant. Since 1990, over 29GW of new electricity generation capacity has been built at a cost of £12.5 billion.[6] In addition, companies have invested in refurbishing existing plant, including spending £1.2 billion on fitting flue gas desulphurisation equipment at over 10 GW of coal plant to meet existing and new environmental legislation. This has ensured that these coal-fired plants will be able to contribute to security of supply well into the future.

3.24. As a result of these developments, the diversity of supply has improved significantly since liberalisation. This is shown in the chart below. Flexibility has also been maintained with a healthy margin of available generation over peak demand despite significant closures of older coal and oil fired plant.

Figure 3:3: GB electricity generation fuel mix



DUKES - Digest of UK energy statistics - DTI publication

Security of supply in the future

3.25. Since the late 1990s, there has been less investment in new generating capacity, as the market responded to a capacity surplus and falling wholesale prices by mothballing or closing plant. Reserve margins fell by around 15% the two years

[5] Detail behind the informed in this section can be found in Appendix Two.
[6] Based on modern equivalent asset values.

leading to a 16% margin recorded in October 2003. Over the past two years power prices have recovered due to the EU ETS, tightening supply/demand balance and increased gas and oil prices. As a result of this 'pricing message' mothballed plants have been returned to service and some new stations have been completed. As a consequence, NGG recorded reserve margins in the 20-23% range since October 2003. Further, there has been a renewal of interest in building new generating plant.

National Grid has been notified of plans to build up to 12.6GW of new capacity by 2010. This consists of gas-fired plant, wind farms and a new interconnector linking England and the Netherlands. Coal-fired generators have recently announced plans to invest over £1bn in FGD equipment to extend the life of another 9GW of existing coal-fired plant.

3.26. More recently, announcements have been made by companies looking into the feasibility of investing in new, low carbon forms of generation including clean coal, gas with carbon capture and storage, and nuclear power.

Outlook for the electricity market

3.27. Experience since privatisation and the recent upsurge in interest in building new generating plants and refurbishing existing ones suggest that the market will deliver security of supply. Recently announced plans suggest that concerns that the market will only invest in gas fired stations appear to be misplaced. The market has a firm track record of investing to increase diversity and not to invest in single technologies or fuel types. There is also evidence that the market is responding to the incentives created by the EU ETS and Renewables Obligation Certificate (ROC) Scheme to invest in low carbon technologies to help reduce carbon emissions.

4. How energy markets can help meet the carbon challenge

Summary

4.1. Tackling climate change is one of the most challenging and important issues of the 21st Century. The Government has shown global leadership on the issue of reducing greenhouse gas emissions. It has set challenging domestic carbon dioxide abatement targets. It has played a leading role in seeking to find a long term multilateral solution with other countries.

4.2. The Government should continue to try to use emission trading schemes as the primary policy instrument to meets it targets. Emissions trading schemes will help to reduce greenhouse gas emissions at lower costs than other alternative measures. It should seek to extend the coverage of the EU ETS to all of the sectors that are major greenhouse gas emitters. It should also try to make future phases of the scheme cover longer periods of fifteen years or more. This will align the schemes with the investment timescales of the industries that participate in the scheme and should lead to lower costs of emission reductions.

4.3. However, until international agreements beyond the existing Kyoto protocol are in place, involving all of the major carbon emitting countries and sectors of the economy, there are challenges for the UK, including for energy markets, in helping to meet the government's climate change targets without damaging competitiveness. We set out proposals, based on funded long term carbon contracts, which the Government could adopt if EU ETS proves inadequate. They would help the Government, as an interim measure, to stay on a path to meet its carbon dioxide reduction targets before new international agreements are put in place.

4.4. The energy sector is already responding to the incentives created by the trading scheme and is likely to invest in a diverse range of technologies on the supply and demand sides to reduce emissions. One such technological advance is that of innovative or 'smart' metering. Ofgem has in the last six months led a series of initiatives in this area (a major seminar, workshops, and full consultation exercise) and is currently preparing its results of this exercise. We will want to co-ordinate our proposals with those of the Government, the most recent example being the financing for trails of smart meters in trial in the budget.

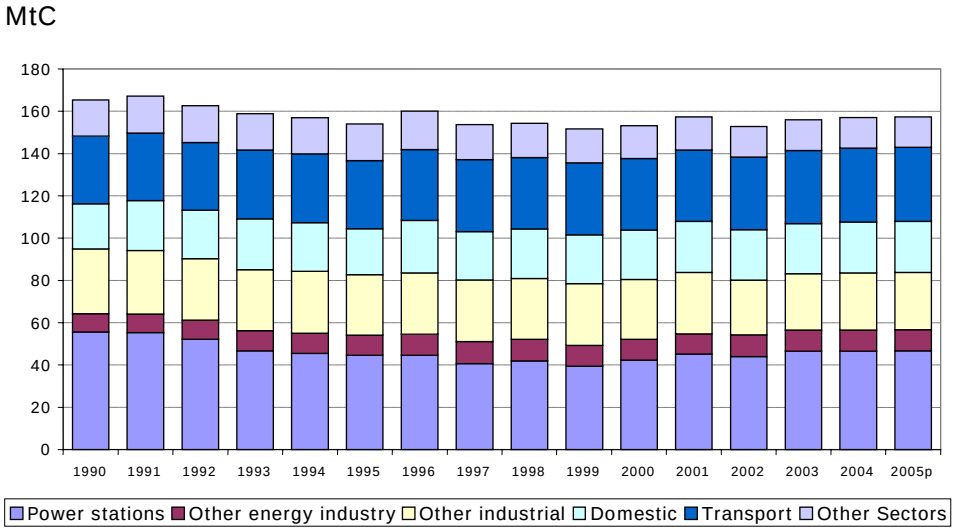
4.5. Ofgem has a range of duties relating to the environment and sustainability, which we take account of in all that we do. We will publish a new annual sustainability report which will address our own response to the sustainability challenge and that of the energy sector.

The role of the energy sector to date

4.6. The emission of carbon dioxide into the atmosphere occurs primarily because of the burning of fossil fuels. The key sectors where such fuels are burnt are transport, industry, the service and residential sectors and electricity generation. The electricity generation sector continues to be the largest carbon dioxide emitting sector in the economy.

4.7. The chart below shows that between 1990 and 2005 the UK's carbon dioxide emissions have fallen by 5% in aggregate. It also demonstrates that some sectors' contribution, primarily the power and industrial sectors', to this reduction has been more marked than others. By contrast the transportation and domestic sectors have increased their emissions over the period.

Figure 4.1 UK carbon dioxide emissions



Source: DTI, Energy Trends, March 2006.

4.8. The electricity sector can contribute to reducing the UK's carbon dioxide emissions in two ways. First, in electricity generation, or the supply side, by investing in existing and new, innovative technologies such as renewables, microgeneration, nuclear and coal and gas-fired plant with carbon capture and storage to reduce (or eliminate) emissions from generating electricity in power stations. Second, through improving energy efficiency, or the demand side, and reducing the amount of electricity that customers use.[7]

4.9. The UK currently emits around 2% of global greenhouse gas emissions. Even if the UK were to significantly reduce emissions the impact on global climate change would be negligible without similar reductions from the other major emitting countries. There is therefore a tension between:

- providing leadership in reducing greenhouse gas emissions to show others what is possible and to gain an early lead in developing low carbon industries and new technologies; and
- damaging the UK's competitiveness if the government moves too far ahead of other industrialised countries and the costs of abatement are found to be significant.

[7] Note that gas efficiency would show up as household sector - not energy.

The supply side

4.10. The supply side of the energy market has already played a significant role in helping to reduce carbon dioxide emissions because companies have invested £12.5bn in 29GW of new gas-fired power stations since the 1990s. This was triggered by improvements in the technology of power stations using gas as a fuel, changes to EU regulations on permissible uses of gas, and (at the time) the relatively low price of gas. A typical gas fired power station emits about a third of the carbon dioxide per megawatt hour of electricity generated as compared to a typical coal-fired plant.

4.11. The introduction of EU ETS from 1 January 2005 has increased the commercial incentives on electricity generators to lower their emissions. Generating companies now have to have sufficient allowances to cover the carbon dioxide emissions from their plant. Allowances can be bought and sold and traded across the EU and with other industries included in the scheme or from intermediaries. Generators therefore have a commercial incentive to reduce their emissions so that they can reduce the cost of buying more allowances or increase the number of allowances they can sell.

4.12. The government also introduced the Renewables Obligation in 2002 as part of its strategy to cut UK carbon dioxide emissions. This places an obligation on energy suppliers to source an increasing proportion of their customers' demand from renewable sources of energy.

4.13. Some of this progress in reducing emissions has been undermined by recent movements in gas prices in the UK. The very high wholesale prices have made gas-fired generation more expensive to run than coal, even when the costs of securing allowances under the EU ETS are taken into account.

The demand side[8]

4.14. The demand side also has a significant role to play in reducing emissions. For business customers, the government introduced the Climate Change Levy on gas and electricity bills in 2001 and allowed companies an 80% discount on the levy if they signed Climate Change Agreements. The government estimates that these two programmes working together will save 6.2 MtC per year in 2010.[9]

4.15. For domestic customers, the government introduced the Energy Efficiency Commitment (EEC), an obligation on gas and electricity suppliers to increase the efficiency of the energy use of their domestic customers. The first phase of the scheme ran from 2002 to 2005, and was intended to deliver lifetime energy savings of 62 TWh through energy efficiency measures such as low energy light bulbs, cavity wall insulation and subsidising lower energy domestic appliances. Analysis carried out by the Energy Savings Trust suggests that programmes to improve energy efficiency have had some impact in curbing the growth in energy demand, but have not led to an outright reduction.

[8] Emission reductions quoted in this section include savings in fuels other than electricity; these savings appear in the relevant sector (domestic, industrial etc) rather than energy supply.
[9] Source CCPR document March 2006 p 47 (Cambridge Econometrics work for HMRC on CCL) and p. 49 for CCAs (quoting "CCA Target reviews").

Assessment of the current arrangements

4.16. We strongly support the Government's commitment to policy measures to tackle greenhouse gas emissions that are based on, and work with, existing market arrangements. The successful launch of the EU ETS provides an important step forward and should form the basis for further action. The trading scheme will allow emission reduction targets across the EU to be met at lower costs than alternative arrangements such as sector or country specific targets.

4.17. There are, however, some shortcomings of the existing scheme that limit its current effectiveness. We think that there are two important actions for Government in relation to the development of the ETS. First, the Government should seek to extend the scheme to cover all major greenhouse gas emitting sectors of the economy so that all emitting sectors are playing their part. Second, the Government should try to extend future phases of the emissions scheme beyond five years to much longer time horizons of fifteen years and beyond. This will align the schemes with the investment time horizons for the industries, including investment in lower carbon forms of production.

4.18. If a longer term scheme could be put in place that covered all of the major greenhouse gas emitting sectors, and over a longer time period, the energy market would respond to the prices and incentives created by the scheme and play its part in helping to meet emission reduction targets. However, in the absence of certainty over a longer term trading scheme, energy companies and customers may be reluctant to invest in expensive and long-lived assets or in research and development to develop new technologies. This might force companies to take shorter term measures with higher costs to customers.

Long term carbon contracts

4.19. In the section below we set out some ideas that the Government could consider adopting if EU ETS does not prove adequate. These are based on long term carbon contracts[10] between the government and companies. They are designed to work with the current (and any future) emissions trading schemes including the EU ETS. They could also be designed to be self-funding. Further details of how the scheme might work with detailed examples are set out in Appendix 3.

4.20. The Government would invite companies to bid for contracts where the company committed to deliver a defined reduction in carbon emissions for a set number of years in return for a payment from the government. Ideally this bidding process could be open to any company that could demonstrate it could cut greenhouse gas emissions - either on the supply side (such as electricity generators and large industrial companies) or on the demand side (for example companies offering energy efficiency measures). The costs of these contracts need not be significant. At the current traded price of approximately £65/tC, contracts to reduce emissions by 10MtC, representing a 6% reduction in UK carbon dioxide emissions

[10] Proposals to auction long term carbon contracts are not new. The UK Emission Trading Scheme was based on a competitive auction where companies bid for payments from government in return for reductions in their carbon emissions. See also Helm and Hepburn, 'Carbon contracts and energy policy: An outline proposal', October 2005.

from 1990 levels, would cost about £650m per annum. In the appendix we show how the government might be able to recover the costs of these contracts by selling the contracts back into future trading schemes beyond 2012.

4.21. The Government could use the existing scheme to fund contracts to help it meet its greenhouse gas reduction targets, by reducing the free allocation of allowances to generators and auctioning allowances to the maximum extent possible (10% in phase 2). The proceeds of auctions of these allowances could fund long term carbon contracts. The Government has recently suggested in its draft National Allocation Plan that it intends to auction between 2% and 10% of allowances. Based on an allowance price of €25/tCO2 this could raise up to £400m per annum[11].

4.22. One of the shortcomings of the existing scheme is that allowances are allocated free to companies and, in particular, to electricity generators. Although the generators receive most of their required allowances for free, they will factor in the full traded allowance price when selling electricity on the wholesale market. This is because some generators will need to buy allowances to cover their emissions and will factor the cost of these allowances into their price. Even generators who hold enough allowances can sell them and will only generate if the electricity price is high enough to compensate them for using and not selling their allowances.

4.23. The free allocation of allowances therefore increases generators' profits. When the EU ETS was first introduced, most forecasts of allowance prices in the first two phases were relatively low and the forecast level of profit increase was relatively small. The actual traded price has been higher than expected, at around €25/tCO2. Based on the current market price of allowances, the value of the allowances allocated free to generators in Phase 1 was £7.3bn. The value of the allowances that the government has said it will allocate to generators in Phase 2 could be £12.0bn at current allowance prices. The additional profits to generators could therefore be as high as £19bn over the eight years of the two phases. The true effect is unlikely to be this large. Some generators will not be able to raise their prices to include the price of allowances as they sell their output under long term contracts at fixed prices. And some suppliers who own generation may not choose to pass through allowance prices immediately to customers. But the overall impact is still likely to be very large. Reducing the free allocation of allowances to generators to the maximum extent possible will mitigate this effect and provide a source of funding for contracts to secure further carbon emission reductions or for measures to help alleviate fuel poverty.

[11] The analysis in this document is based on an allowance price of €25/tCO2, which was a typical price in 2005 and early 2006. Since the analysis was completed, the allowance price has dropped to around €12/tCO2. The effect of using the lower allowance price in the analysis would be to reduce the estimate of the revenue that could be raised through an auction and reduce the estimate of the value of allowances allocated to the generation sector over the first two phases. The rapid change in allowance price in late April 2006 demonstrates the volatility in the market and the inherent uncertainty in predicting allowance prices for the rest of Phase 1 and in later phases of the scheme. However, the price may be less volatile as the market matures and allowance prices may be higher in future phases as emission reduction targets become more challenging.

5. Additional action needed to address fuel poverty

Summary

5.1. Fuel poverty is part of a wider problem of poverty and social exclusion and is caused by high energy prices, low incomes and poor housing conditions.

5.2. There is an important and continuing role for Ofgem, and industry, to help ensure that prices are no higher than necessary and to promote energy efficiency. But given the likelihood that energy prices will remain at higher levels, and the wider social causes of fuel poverty, there will be a limit to the role of the market and regulation in tackling fuel poverty. We believe that the focus should be on raising incomes and improving housing - a role primarily for government.

5.3. Further, we suggest that there needs to be a new drive to identify better those in need and to deliver more comprehensive solutions - a new 'find and fix' approach. Bringing together EEC and Warm Front funding under a single agency should be considered to maximise the impact of the measures and ensure help is targeted where it is most needed. Additional funding could be made available by recycling revenues from environmental schemes.

Our view of the challenge

5.4. Rising energy prices are threatening the good progress that has been made since 1996 to reduce fuel poverty. Once this winter's wholesale prices feed through there could be around 2 million vulnerable households in fuel poverty in England and Wales, and around 500,000 in Scotland.

5.5. While new infrastructure and gas supplies will ease the pressure on wholesale energy prices, these are unlikely to return to the levels seen at the beginning of the decade, reflecting increased environmental costs, higher oil prices and stronger global energy demand.

5.6. Competition and regulation have and will continue to play a key role in keeping pressure on prices. Suppliers have responded through a range of social initiatives (social tariffs, trust funds, benefits health checks). We estimate they have spent around £110 million in 2004/5 in addition to the £160 million required under EEC. These initiatives are to be welcomed.

5.7. But in an era of higher energy prices these measures will not be sufficient and given the scale and wider causes of fuel poverty, further government intervention will be required.

Ofgem's role and work

5.8. Ofgem will continue to work on a number of fronts to help tackle fuel poverty - keeping pressure on prices and promoting energy efficiency.

5.9. Through regular market surveillance and by promoting greater transparency we help make sure that markets are working as effectively and efficiently as possible.

5.10. By breaking down barriers, for example to the development of smarter metering, consumers could benefit from better information to manage household energy costs. This could also spawn more innovative meters to replace expensive pre-payment meters with cheaper alternatives. We are also looking at the barriers to the further expansion of the gas network and to the development of microgeneration.

5.11. Through our role to facilitate best practice we will continue to use research to encourage the development of social initiatives and good quality advice to consumers. We will also work with other agencies, for example to help break down barriers to the use of bank accounts and direct debits among low income customers which can provide access to cheaper tariffs. In partnership with consumer organisations, we will also work to get the message across about the choices available to reduce household energy costs.

Incomes and housing

5.12. Nearly two thirds (61%) of the reduction in fuel poverty to 2003 is attributed to rising incomes. Raising incomes should remain a primary focus, including ensuring that that those entitled to benefits are taking them up.[12]

5.13. Improving the quality of housing stock should also remain a key focus. Significant strides have been made through measures such as the Decent Homes standard, Warm Front and EEC, to improve energy efficiency and install cost effective heating systems in homes. These measures provide enduring and sustainable solutions to fuel poverty.

5.14. Even though the recent increase in fuel poverty has been driven by higher fuel prices we firmly believe that the solution for most households lies in improved incomes and better housing rather than direct intervention in the prices which, on the scale required, could undermine competitive markets.

More funding and comprehensive solutions

5.15. The Fuel Poverty Advisory Group estimates that £3.9 billion is needed to meet the 2010 fuel poverty target – a 25-30% increase on current programmes. Our view is that additional funding should come from general taxation and not from consumers via fuel bills. The increased prices required could impact hard on those who, while not in fuel poverty, may be struggling to pay their bills.

5.16. Given that the cost of environmental measures has been a driver of higher energy costs, there is a case to recycle some of the funds raised through these measures to help tackle fuel poverty. For example, if government were to auction allowances under the EU ETS some of the revenue generated from this could be used to fund further measures to help tackle fuel poverty.

[12] For example we note from a DWP press release in January 2006 that between £1.6 billion and £2.4 billion of pension credit was unclaimed in 2003/4.

5.17. The challenge is not simply financial but also one of identifying those in fuel poverty and persuading them to take up the help available.

5.18. New impetus needs to be given to identifying individuals who need help and ensuring comprehensive solutions are offered – a 'find and fix' approach. While the level of co-ordination between EEC and Warm Front has improved, those in need are still often offered only partial solutions. There is also scope to broaden benefits health checks and to ensure that the full range of tariffs and payment options are considered.

5.19. Once all practical and cost effective measures are considered, then direct financial help for those in hard to treat properties should be considered.

5.20. Maximising the delivery of existing schemes is also vital. For example, under a single organisation within government different sources of help could be pooled and better targeted. It could also help coordinate a more holistic approach from suppliers, front line agencies (such as health workers), Government Departments, charities and local authorities and, in turn, could help reduce consumer confusion and improve evaluation of the impact and interaction of different measures. These proposals should be considered in the context of the Government's plans for changes to consumer representation in the energy (and other utility) sectors.

5.21. There have been calls from suppliers to reduce the size of the priority group under EEC. Any decision on the priority group must be based on evidence about the number of opportunities still existing to provide measures to that group, and this evidence needs to be collected urgently. Moreover, given the contribution of EEC to the alleviation of fuel poverty through providing cost-effective insulation measures, any reduction in the support would need to be made up in other ways.

A clear and meaningful long term goal

5.22. The current target is based around a particular statistical definition of fuel poverty. While we do not want to see any lessening of the commitment to tackle the underlying problem, it is important that chasing a particular target does not lead to inefficient solutions. For example, paying benefits in the form of vouchers so that they count as money off the fuel bill, rather than income, and therefore have a greater impact on the statistical measure of fuel poverty, simply adds to administration costs and consumer confusion.

5.23. Establishing a target for housing standards, together with the existing broader poverty targets, would provide an alternative to the current fuel poverty target.

Appendix 1 - Networks

Reductions in network charges

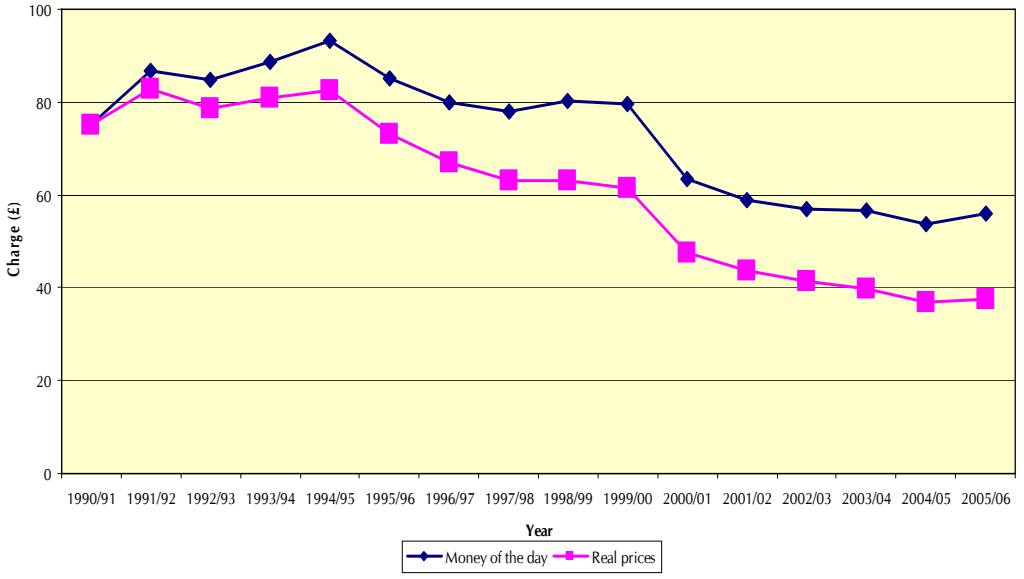
1.1. Network charges as a proportion of a typical domestic bill are:

- electricity 21% (distribution 17%, transmission 4%); and
- gas 18% (distribution 16%, transmission 2%).

1.2. Regulation has encouraged efficiency and there has been a substantial reduction in network charges since privatisation:

- electricity distribution – 50% since 1990 (Figure 1.1);
- electricity transmission – 41% since 1990; and
- gas transportation – 41% since 1994.

Figure 1.1: Average distribution charge to a typical domestic customer (3,300 kWh/year)



Source: Ofgem.

Investment history

1.3. Despite the significant reduction in network charges, investment under RPI-X has been higher than in the period before privatisation:

- electricity investment under CEGB
  - transmission networks: £1.3bn was invested between 1984 and 1989 (£0.25bn/year), and
  - distribution networks: £3.8bn was invested between 1986 and 1990 (£0.75bn/year).

- electricity investment under price controls
  - electricity transmission networks: £6bn was invested between 1991 and 2005 (£0.4bn/year);
  - electricity distribution networks: £15.5bn was invested between 1991 and 2005 (£1bn/year); and
  - projected electricity distribution investment under DPCR4: £7.4bn (£1.5bn/year).

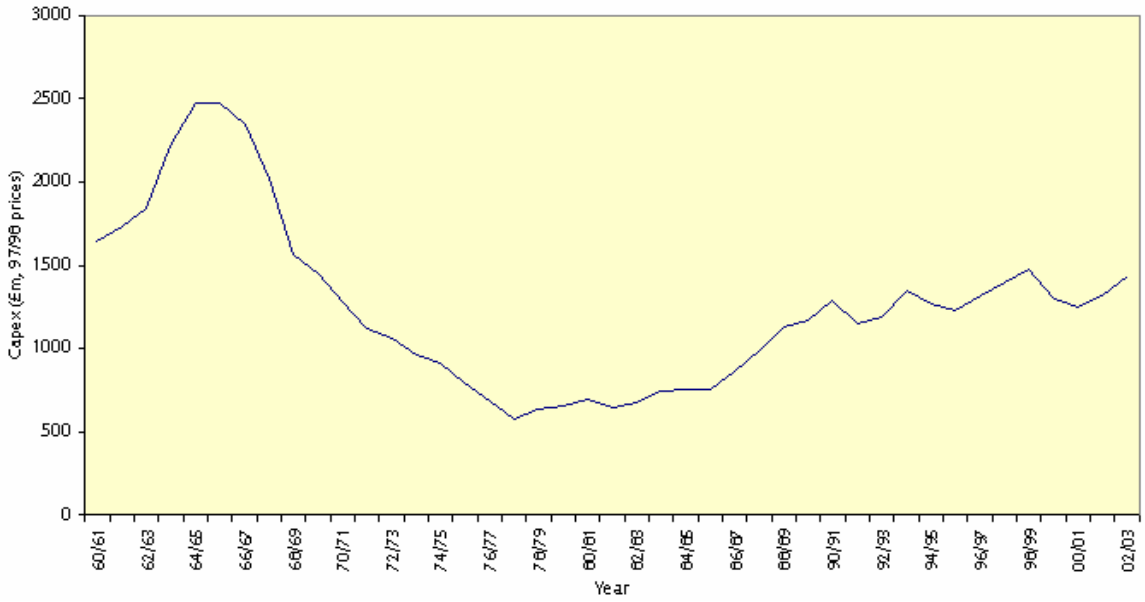
Longer-term perspective

1.4. Network investment, particularly to replace ageing assets, is considered at each price review in a much longer-term context than just the 5 year price control period. Capital investment is required:

- to respond to charging patterns of supply and demand, including network extension - load related expenditure (LRE); and
- to replace ageing assets - non load related expenditure (NLRE).

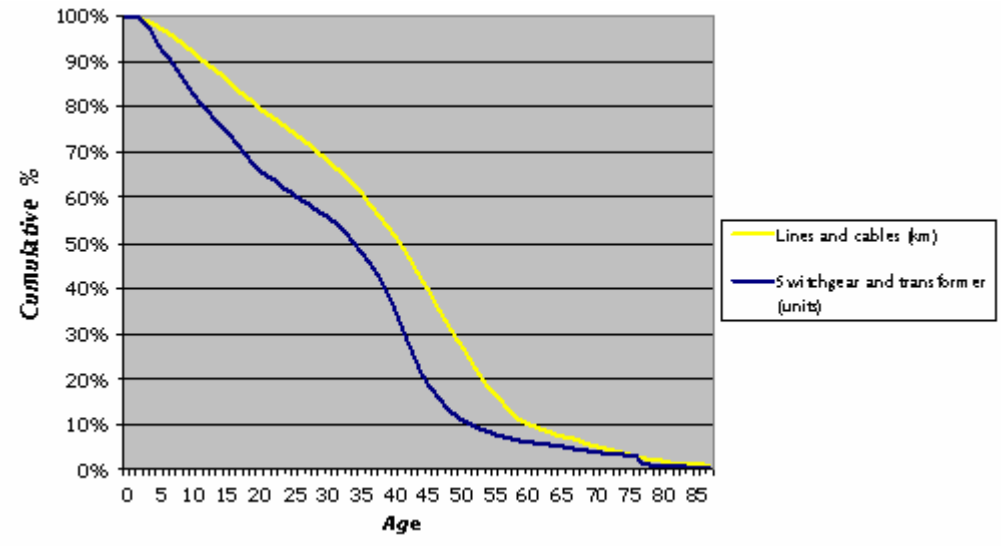
1.5. The history of investment over previous decades, illustrated in Figure 1.2, determines the age profile of the existing asset base at a particular point in time, as highlighted in Figure 1.3. For example, Figure 1.3 shows that around 60% of switchgear/transformers on the distribution system are over 25 years old and 35% are over 40 years old. While replacement will be driven by a risk-based assessment of such issues as condition and criticality, it is possible to derive broad approximations of future expenditure using age as a proxy. At DPCR4 we modelled projections of asset replacement on this basis out to 2020, highlighted in Figure 1.4.

Figure 1.2: Capital investment in the UK electricity distribution network



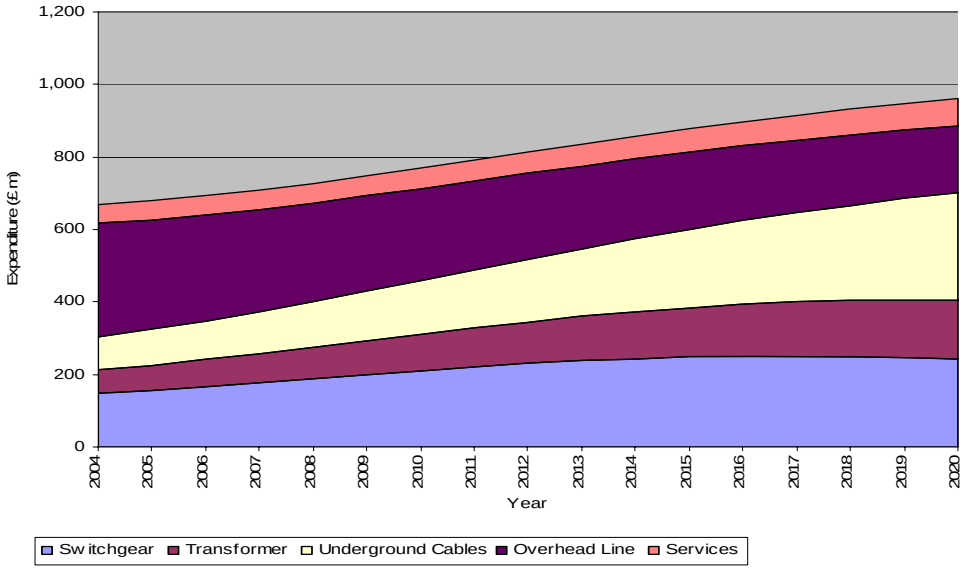
Source: Ofgem.

Figure 1.3: Indicative age profile of electricity distribution assets



Source: Ofgem.

Figure 1.4: Indicative modelling of electricity distribution asset replacement expenditure



Source: PB Power.

Investing for Safety

1.6. Gas distribution investment has been influenced by Ofgem's work with the Health and Safety Executive (HSE) to ensure that gas distribution networks receive sufficient funding to operate a safe and secure network. In 2002 the accelerated mains replacement programme was introduced whereby gas distribution companies were required to invest in the replacement of all iron mains within 30 metres of premises over the course of 30 years.

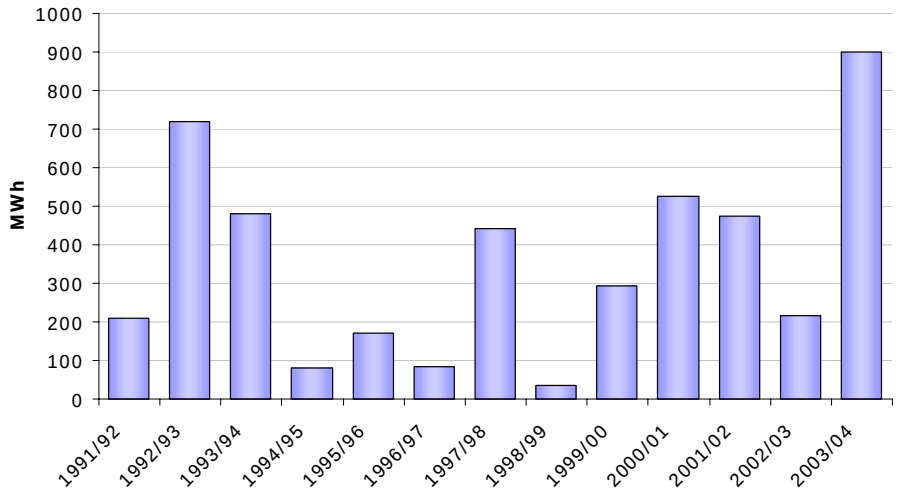
1.7. During the first 3 years of the programme, distribution companies spent around £1.3 billion replacing iron mains and service pipes. This accelerated mains replacement programme will reach its peak workload during the next couple of years which is expected to involve a near doubling of activity from historic levels.

1.8. In addition to this, between 2002-03 and 2004-05 gas distribution companies spent over £600 million on reinforcing and extending their networks.

Network performance

- Reductions in charges have not been at the expense of network performance and service. The transmission network is 99.9997% reliable. Figure 1.5 shows the amount of energy unsupplied by National Grid. Energy lost in 2003/4 was equivalent to about 0.0003% of total energy supplied.

Figure 1.5: Transmission network reliability (energy unsupplied by National Grid)

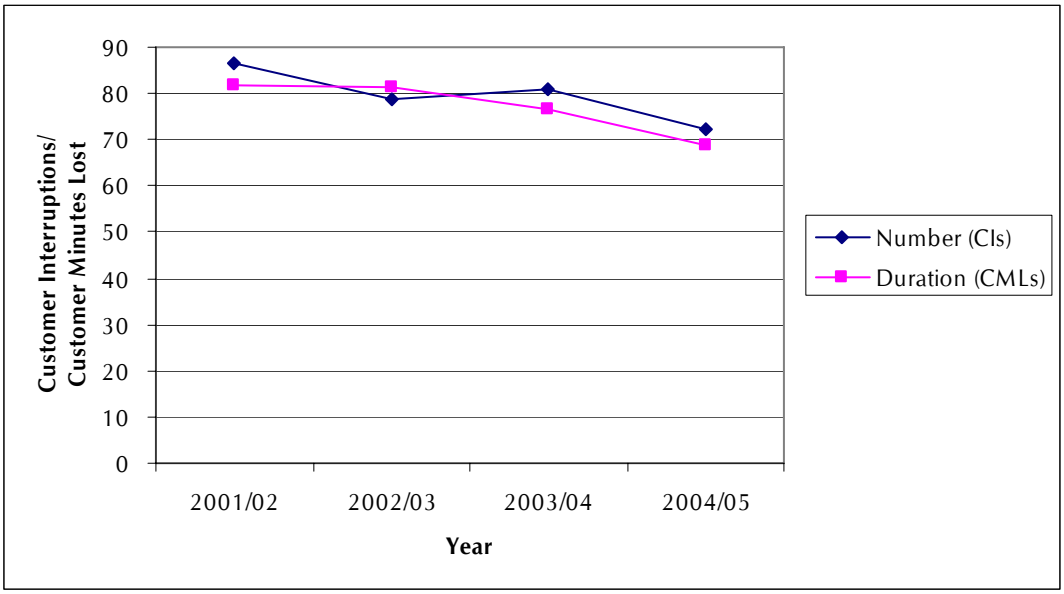


Source: Ofgem, Electricity transmission network reliability incentive schemes: Initial Proposals, October 2004, 240/04, p.11.

- The distribution network has experienced a 16% improvement in reliability since new incentives were introduced in 2002. Figure 1.6 shows average Customer Interruptions (CIs) per 100 customers and average Customer Minutes Lost

(CMLs), excluding exceptional events. Interruptions are now less of an issue on the gas networks.

Figure 1.6: Network performance of electricity distribution network operators



Source: Ofgem, 2004/05 Electricity Distribution Quality of Service Report, November 2005, 258/05, p.8 (data from figures 3.1. and 3.2).

Future investment

1.9. The capital expenditure bids submitted for each transmission licensee for the 2007-12 price control (transmission operator activities) are set out in the table below. This shows that the current regulatory regime, far from discouraging investment, has brought forth a huge appetite for more investment.

Table 1.7: Investment bids for 2007 to 2012, and current allowances (£m, 2004/5 prices)

	Non-load related capex bid	Load related capex bid	Total capex allowance last review	% increase
National Grid				
- Gas	424	791	892	36%
- Electricity	2460	1337	1453	161%
Scottish Power	366	347	152	369%
Scottish Hydro	56	766	71	1057%
Total	3307	3241	2568	155%

Source: Ofgem, Transmission Price Control Review 2007-2012: Third Consultation, March 2006, 51/06, p.3.

Regulatory evolution

Auctions / user commitment

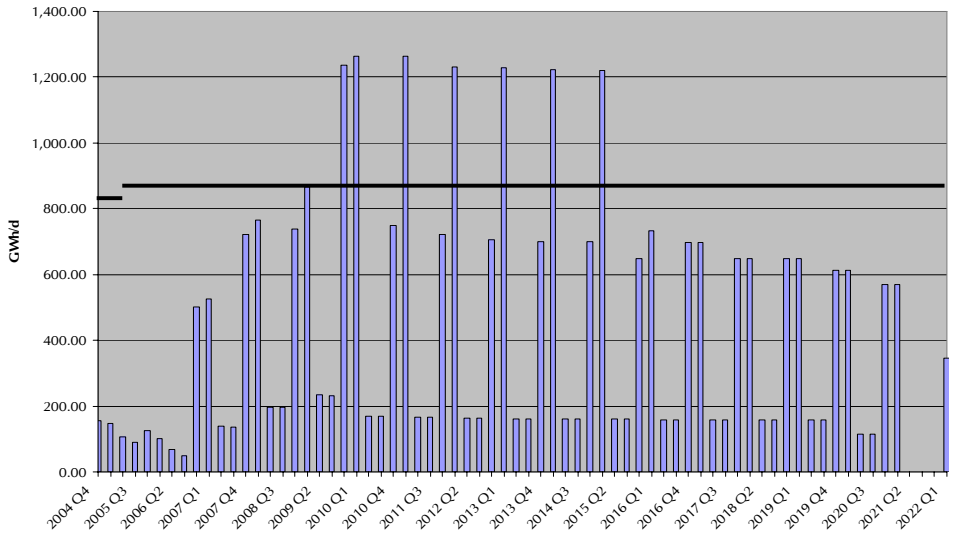
1.10. Following a major issue at St. Fergus in 1998, Ofgem introduced a new system to make gas transmission more responsive to user needs.

1.11. Entry capacity auctions seek to allocate existing capacity efficiently between users and allow users to give a firm indication of the need to increase capacity.

1.12. Subject to certain tests, auction results oblige the transmission company to provide additional capacity by a fixed date (normally 3 years) and automatically trigger price control funding.

1.13. Figure 1.8 illustrates the auction results for Easington, where auction prices signal the need for an increase in capacity against a baseline (shown as a black line).

Figure 1.8: Easington Auction

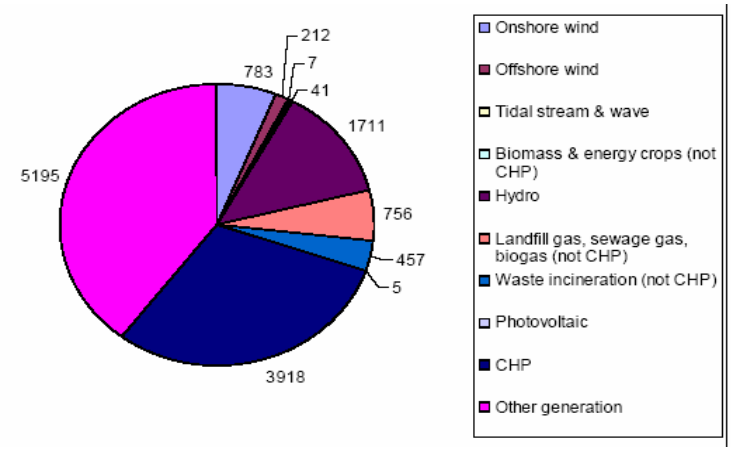


Source: National Grid.

Distributed generation and losses

1.14. The current electricity distribution price control runs from 2005-10. This places incentives on distribution companies to connect and utilise distributed generation efficiently; introduces new incentives for innovation and strengthens the losses incentive (also an issue in gas distribution).

Figure 1.9: Capacity of Distributed Generation connected at September 2005



At Sept 2005:

- 13,085 MW connected (see pie chart for composition)

In previous 12 months:

- 427 MW connected (3%)
- 3193 MW offers (24%)

Source: Energy Networks Association website.

1.15. In addition, the structure of distribution charges introduced from 1 April 2005 involved a movement from deep to shallower connection charges and the introduction of generator use of system charges. The structure of distribution charges increased transparency through the introduction of published charging statements setting out the method by which charges are calculated. This project is ongoing with the development of more economic charges expected prior to the conclusion of the next price control. The price control and charging developments must work together as a package to encourage efficient, coordinated solutions.

Distributed Generation (DG) Incentive

1.16. The DG Incentive is specifically aimed at encouraging electricity distribution network operators to connect DG to their network in a timely and efficient manner. 80% of the capital cost is passed through by the distribution network operator, with a £1.5/kW per annum incentive rate for connected distributed generation and a £1/kW per annum rate in respect of operations and maintenance costs.

Innovation Funding Incentive (IFI)

1.17. Expenditure is allowed on a 'use it or lose it' basis up to 0.5% of revenue (amounting to £1-2m per company). The companies fund a proportion of each project (averaging 20%). Annual, open reporting of projects is required to promote best practice. This scheme started in October 2004.

Registered Power Zone (RPZ)

1.18. This is specifically aimed at technical innovation for DG connections. An enhanced financial incentive (three times the main DG incentive) provides a balance to innovation risks. As with the IFI, open reporting of RPZ projects is required to promote best practice across the sector.

Losses

1.19. Losses on the gas and electricity networks can be influenced by the decisions of the network operators. For example, shrinkage on the gas distribution networks comprises leaks, theft and gas used for operational reasons. The gas distribution network companies receive a fixed allowance for shrinkage under the current price control and are therefore incentivised to reduce these costs over a five year period. The amount of gas lost through shrinkage is falling, partly due to the accelerated mains replacement programme.

1.20. Losses on the electricity distribution system vary between network operators, largely due to the differing balance of rural/urban networks and network configurations. The companies receive a reward/(penalty) of £48/MWh for each MWh or loss reduction/(increase) against a benchmark. The value of £48/MWh was set having considered the impact of the cost of carbon.

Reducing barriers

1.21. In addition to the price controls, our work on network regulation includes facilitating reductions in commercial and technical barriers to new system users. For example:

- we are co-ordinating the Electricity Networks Strategy Group and are actively contributing to the working groups and workstreams associated with this, as we did with the predecessor organisations;
- we are working with DTI on arrangements for networks to connect offshore generation;
- we have led a project to review commercial arrangements in electricity distribution and have now secured commitments to the introduction of a multilateral use of system agreement; and
- we have recently announced a forum on connecting microgeneration, covering both networks and market issues.

Appendix 2 - How markets deliver security of supply

Introduction

1.1. In Section 3 we examined whether markets have and will continue to deliver secure supplies of energy. In this Appendix we look at this issue in more detail focussing on whether markets are more successful than central planning in delivering security of energy supply in a cost effective manner.

1.2. Security of supply is directly related to choice. Supplies are considered to be secure when customers have the choice of consuming at a level dictated by their preferences and are not subjected to involuntary interruptions. However, at the same time, a certain level of involuntary interruption may be economic. As customers must ultimately bear the cost of investment in the infrastructure required to achieve security of supply it might be inappropriate to invest to such a level to guarantee absolutely 100% security of supply. Instead, customers may be willing to put up with the occasional, limited duration, interruption, rather than expend massive resources to limit further the likelihood of such interruptions.

1.3. There are a range of methods to achieve secure supplies of energy. One route is to rely on engineering-based centralised planning processes in which assumptions are made on customer preferences. The alternative is to use markets to reveal information about customer preferences and provide better incentives for economic investment choices. Our view is that the price mechanism that markets deliver conveys more accurate information to a diverse set of investors than a centralised approach that has no such information. As such, our view is that markets deliver security of supply in energy markets in a cost effective manner that is in line with customers' preferences.

1.4. In this Appendix we:

- examine how markets should deliver security of supply; and
- assess the operation of the UK energy markets since liberalisation, and consider whether markets have and will continue to make appropriate investment decisions.

How markets deliver security of supply

1.5. Markets maintain security of supply in both the short term and the long term through the price mechanism. Prices indicate to investors the scarcity of energy in the market. Therefore, when prices are high and expected to stay high, it is usually because energy is scarce and is expected to stay scarce. The expected price allows investors to estimate the expected returns of infrastructure projects that will supply additional energy to the market. Therefore, provided barriers to entry are low, higher prices in energy markets will lead to investment in additional energy production facilities such as, in the electricity market, new power stations and, in the gas market, field development or LNG terminal development. This will lead to improved security of supply. A regime based on central planning has no such

information to use in its assessment of customer preferences and, therefore, is more likely to get it wrong.

1.6. It is important to note that prices impact on the market in many ways, depending on circumstances. For example:

- A price spike in the short term may assist in bringing the system into balance. The system operator is responsible for balancing supply and demand and enters the market to buy from, or sell to, market participants in order to balance the market. When the system is short of energy, the System Operator will enter the market to purchase additional energy. This will usually result in short-term price rises that convey information about shortage to all participants in the market. The demand side will then respond to this signal and price-sensitive customers will voluntarily reduce their consumption to control their costs.
- In the long term, persistent price peaks signal the need to meet demand from a variety of sources (diversity) or for fast response in order to meet unexpected events (flexibility). Different types of assets and technologies like LNG, storage or imports in gas and coal, nuclear and gas in electricity have different characteristics, and price peaks indicate times and circumstances where different solutions are most appropriate.

Performance of the Gas and Electricity Markets

1.7. In the remainder of this Appendix we examine in detail the gas and electricity markets and look at three key questions that have recently been at the forefront of the energy debate:

- Have energy markets delivered investment on time and will they continue to do so?
- Do energy markets invest in capacity to cover low probability/high impact events?
- Do energy markets deliver diversity in supplies?

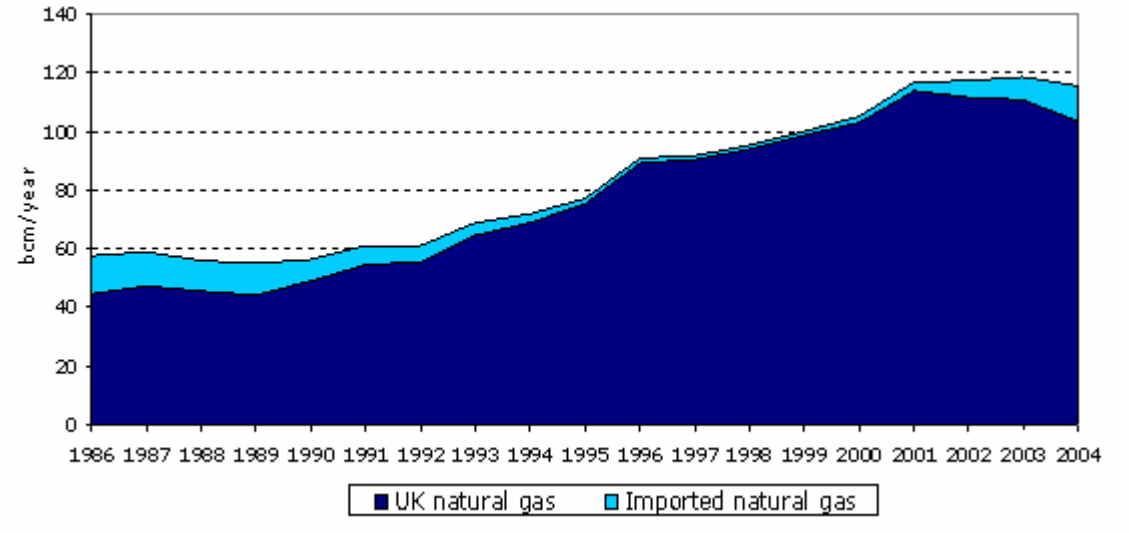
1.8. For all questions, it is worth considering whether the operation of the market has been better than a counterfactual where a central planning process would have made the decisions.

Gas market

Do markets invest on time?

1.9. The presence of significant reserves of gas in the North Sea has meant that, historically, the UK has been largely self-sufficient in gas. Figure 1.1, below, shows that from 1986 to 2004 the UK's gas needs were almost entirely met by the UK Continental Shelf (UKCS), with only a small volume of imports from Norway.

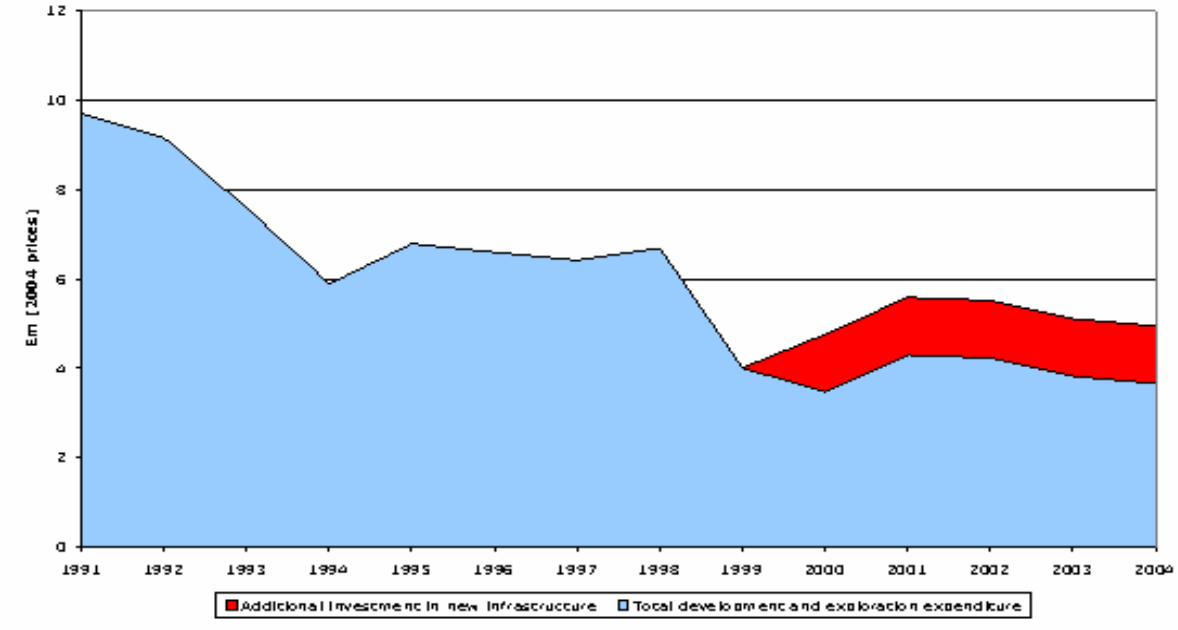
Figure 1.1: Historic UK Gas Position



Source: DUKES - Digest of UK Energy Statistics - DTI Publication

1.10. Figure 1.1 also shows that supplies of gas from the UKCS have more than doubled since the late 1980s. This large increase in production has been delivered through investment by the private sector in both offshore and onshore infrastructure. Since 1991 a total of £82bn has been invested in Exploration and Production (E&P) in the UKCS, as shown in Figure 1.2.

Figure 1.2: Investment in Exploration and Production in the UKCS and in new infrastructure projects to deliver gas to GB (1991-2004)



Source: DTI http://www.og.dti.gov.uk/information/statistics.htm, DTI Brown Book.

1.11. It is, however, worth noting that investment in the UKCS has declined over time as the gas fields enter a mature stage in their development – with fewer new discoveries and a reduction in potential areas in which to explore for reserves. Another effect of the maturing of the UKCS has been that many of the existing fields have entered a period of reduced output as reserves decline. Overall the effect of these two factors has been a decline in the total supplies available from the UKCS since 2000.

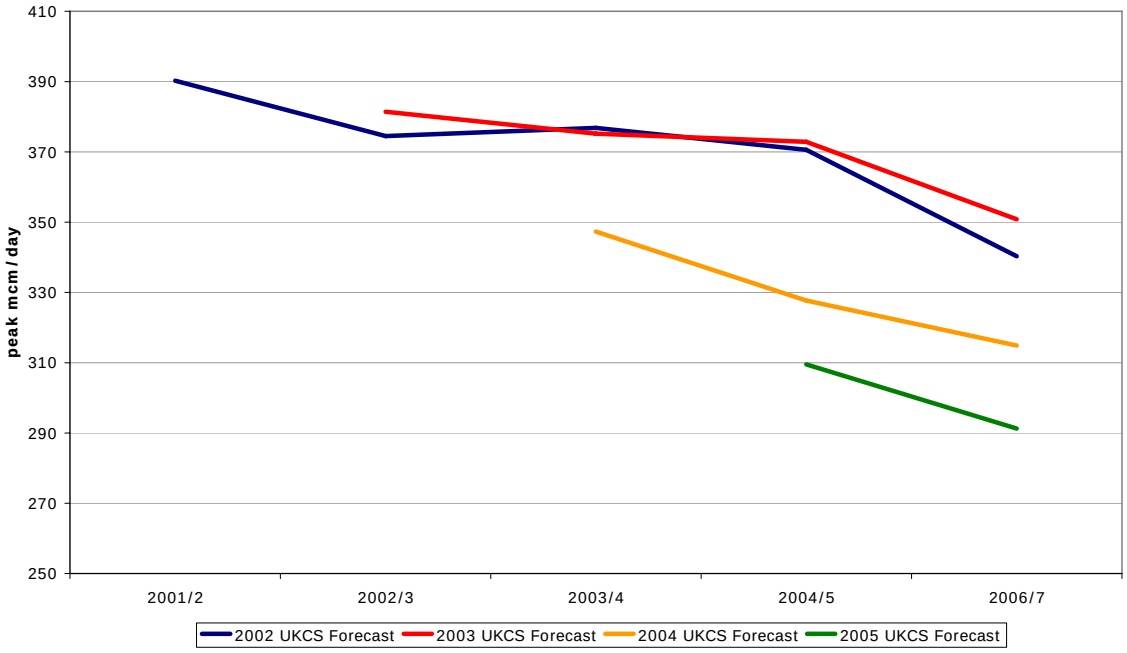
1.12. In anticipation of the forecast decline in the UKCS the market has invested an additional £6.4bn in offshore infrastructure investment to bring new supplies to the UK (Figure 1.2). However, despite this new investment, the peak deliverability of the UKCS, that is the maximum volume of gas that can be delivered to the GB market on a given day, has fallen sharply since 2001. This can be seen in Figure 1.3.

1.13. While some of this shortfall has been made up by interconnector flows from Zeebrugge, some, at times of particularly high demand, has also been made up by customers opting not to consume gas. Customers have made this decision on the basis of prices prevailing in the gas market at the time.

1.14. Therefore, the recent high prices in the gas market have caused some large customers to switch off from using gas. Such prices have generated comment as to why there has been insufficient investment in the years leading up to these high prices and suggestions that, if the investment had been made, this would have placed less reliance on curtailing demand and more on additional infrastructure to supply gas to replace dwindling supplies of UK CS gas.

1.15. Our view is that the market might have failed to respond in the timescale required to prevent the short term price spikes because it failed to realise how quickly the UKCS's peak deliverability was likely to decline. Figure 1.3 below sets out four forecasts made by National Grid of the peak deliverability of the UKCS. It shows that in 2002 and 2003 the peak deliverability of the UKCS in 2006/07 was expected to be about 350 mcm/day. However, by 2005, this forecast of the UKCS's peak deliverability for the same year had fallen by 18% to 290 mcm/day.

Figure 1.3: Comparison of UKCS supply forecasts balance (2002-2005)



Source: National Grid Ten Year Statements.

1.16. Whilst, therefore, it is the case that the market did not foresee the speed with which the deliverability of the UKCS would decline, there is no reason to believe that a central planning process would have had 'better foresight'. Moreover, now it is clear that there is a requirement for additional infrastructure, the market is responding with very significant infrastructure investments, including:

- Interconnectors - 58 bcm/year by 2008;
- LNG - 43 bcm/year by 2010; and
- Storage - 5.4 bcm of additional capacity by 2010

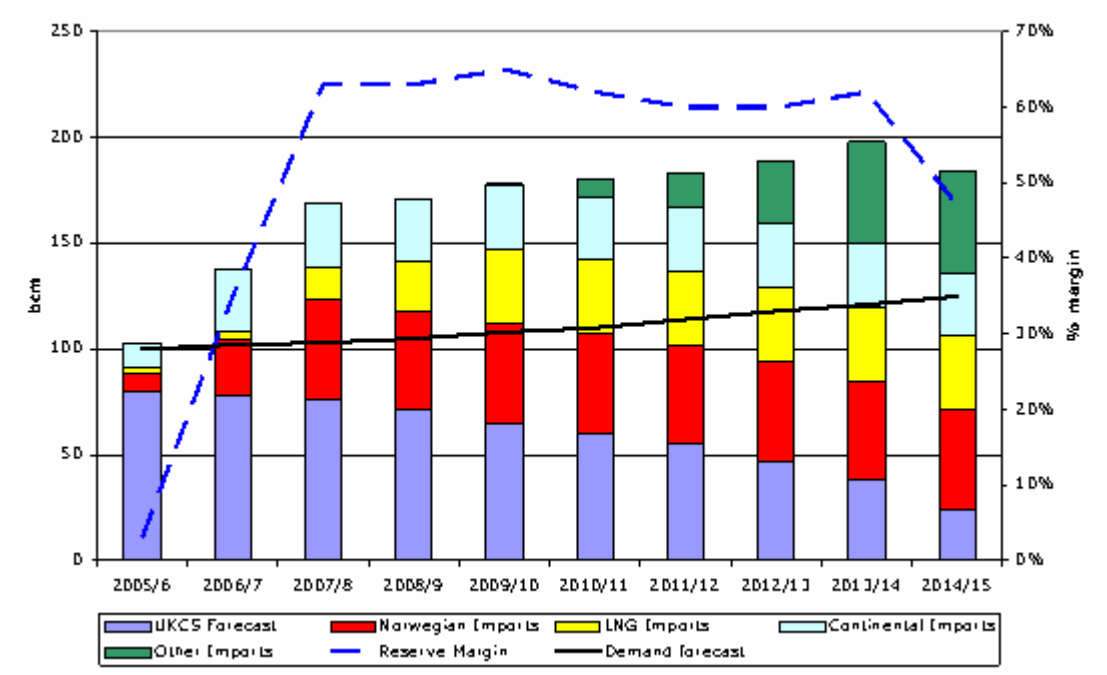
1.17. Ofgem and DTI have worked to improve the flow of information to National Grid and the market about current and future levels of production from the North Sea and Norway through a voluntary information release scheme. This has seen improvements in the quantity and quality of information provided to National Grid and the wider market.

1.18. To demonstrate the extent of investment in gas infrastructure, a complete list of known projects expected to come on stream up until 2011 is presented in Tables 1.3 and 1.4 in Appendix 2 - Supporting Data.

1.19. Driven by market price signals, investors are also seeking innovative ways to increase supply. For example, Venture Production PLC, in a partnership with North American investors, has recently announced plans to invest $300m in acquiring and developing stranded assets in the Southern North Sea.

1.20. The impact of this very significant investment in additional sources of supply is shown in Figure 1.4. Despite the continued decline in forecast supply from the UKCS over the coming years, investment is underway to meet demand. The reserve margin (the excess of supply over demand that allows the system to cope with shocks) increases and remains relatively stable.

Figure 1.4: Future supply demand balance by year 2005/6 to 2014/5



*Other Imports includes LNG projects not yet under construction. However this does not include all possible and planned projects.

Source: National Grid Ten Year Statement 2005.

Do markets invest to manage small probability/high impact events?

1.21. Traditionally the GB gas market's peak demand requirements have been met predominantly by designing offshore fields to allow gas to be delivered year round with flexibility to vary the volume delivered on a seasonal basis. There are also a number of gas fields such as Morecambe Bay South and Sean which were developed in such a way as to provide additional gas to the market at times of peak demand.

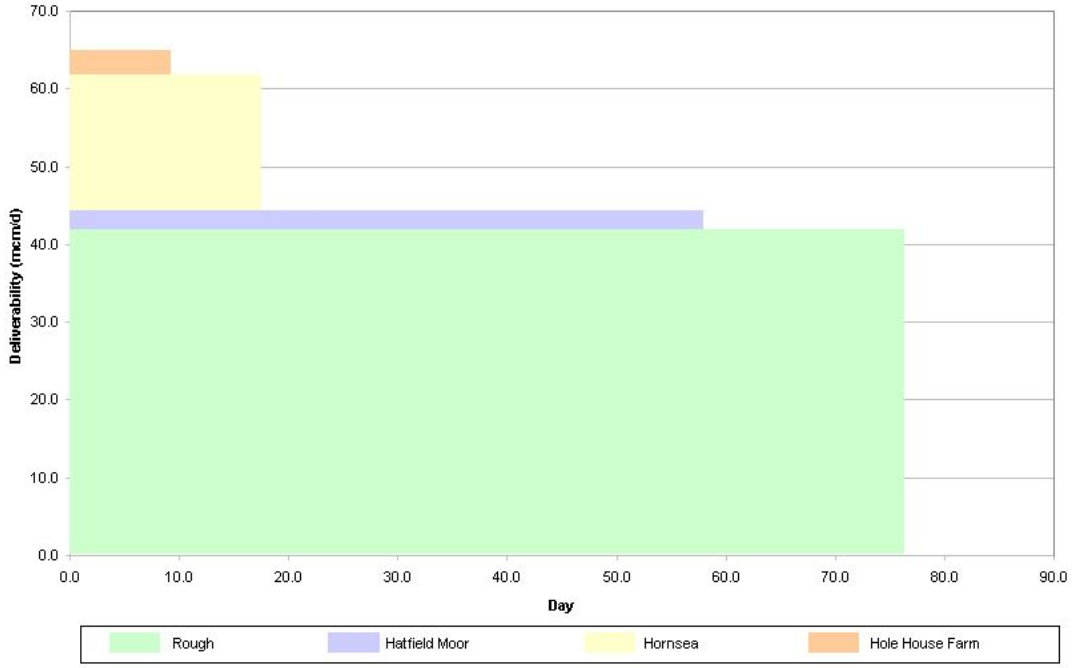
1.22. As already noted, the UKCS is declining and at a faster rate than originally anticipated. For this reason other sources of flexibility are required and the market's ability to manage unexpected events is dependent upon the level of flexibility provided by these sources. The GB gas market has a range of tools to achieve this. These tools include storage sites, drawing on additional gas from neighbouring systems, and demand side response.

Storage

1.23. Storage and LNG storage facilities allow gas to be stored which can then be brought to the market to enable the balancing of demand and supply during peak demand days and/or at times of significant supply disruptions, events that occur on only a few occasions each year.

1.24. Figure 1.5 shows the deliverability of GB storage. The Rough storage facility is the largest of these. It accounts for 82% of the storage capacity in GB and provides 37% of peak deliverability. Other storage facilities are smaller, but provide significant flexibility at times of peak demand.

Figure 1.5: Deliverability of storage facilities in GB

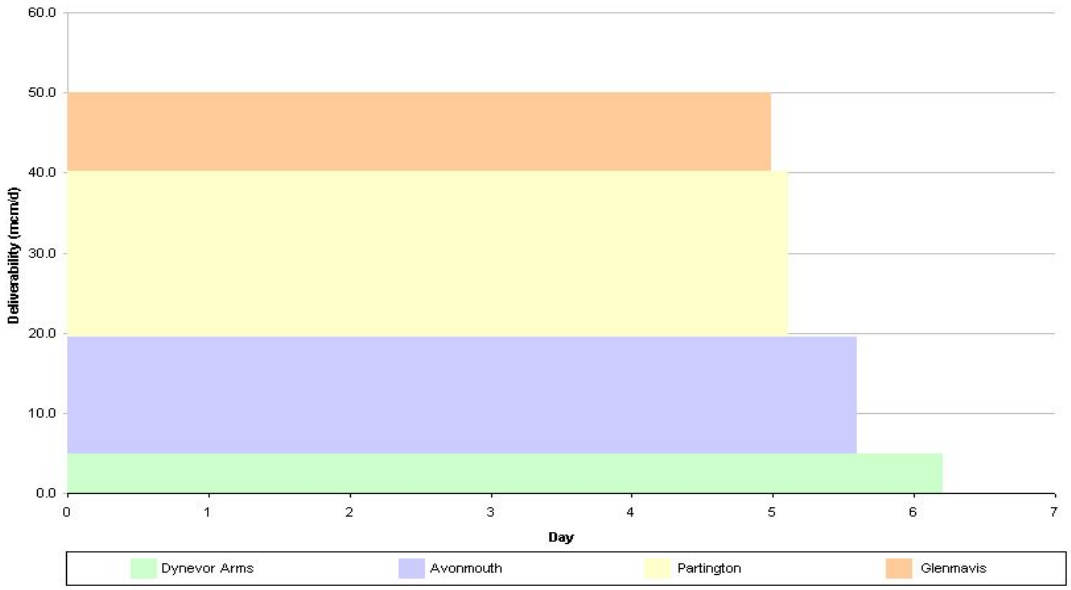


Source: Company press releases.

1.25. LNG storage facilities are particularly important in delivering flexibility. The UK has four LNG storage facilities: Avonmouth, Partington, Dynevor Arms and Glenmavis. The Isle of Grain was an LNG storage facility until converted to an LNG import terminal in 2004.

1.26. These LNG storage facilities have a very high peak deliverability that can be sustained for a short period of time (see figure 1.6).

Figure 1.6: Deliverability of LNG storage facilities in GB



Source: Company press releases.

1.27. The value that the market places on these facilities which provide a high level of deliverability on a few occasions per year, is apparent from the level of interest by market participants in LNG storage capacity auctions. For the past three years all of the available LNG capacity has been sold at each of the facilities. In addition the amount that the market has been willing to pay for this capacity has increased each year. For example, in the 2003/04 LNG capacity auction the average price was at 26.5p/therm, by 2004/05 the prices had doubled, and in the most recent auction the price reached 106p/therm and capacity was oversubscribed.

1.28. In response to high gas price a number of new storage and LNG storage facilities are planned and under construction. Those expected to come on stream by 2010 are shown in Tables 1.4 and 1.7 in Appendix 2 Supporting Data. By winter 2007 there will be an additional 51 mcm/day of new storage providing flexibility at times of peak demand.

Interconnectors

1.29. There is currently one interconnector that can import Continental gas to the GB market. It flows from Zeebrugge to Bacton and has both import and export capacity. In November 2005 the capacity to import to the UK was increased from 25mcm/day to 48mcm/day. In December 2006 there is a further planned increase to 68mcm/day.

1.30. Two additional pipelines are also under construction and expected to start flowing gas in winter 2006/07:

- Balgzand Bacton Pipeline (BBL), which has an annual capacity of 16 bcm. An estimated daily capacity of 44mcm/d . Two thirds of this capacity is expected to be operational for winter 2006/07, with the remaining third expected to be operational at the end of the same winter.

- Langeled, which has an annual capacity of 25 bcm, an estimated daily capacity of 68 mcm/d and is expected to be operational by December 2006.

1.31. Therefore, in winter 2006/07 the GB market will have an import interconnector capacity of 59 bcm/year with an estimated deliverability of 162mcm/day. This will give increased flexibility to meet peak demand and unforeseen events.

1.32. However, experience of winter 2005/06 has shown that peak response from interconnector capacity is less reliable than, for example storage and demand-side response. In this regard, other factors affect interconnector flows such as:

- European weather conditions - when it is cold in Europe and demand is high Continental gas responds to European demand before filling the interconnector;

- the differential between European and UK gas prices - if prices are higher in Europe then the gas will not flow; and

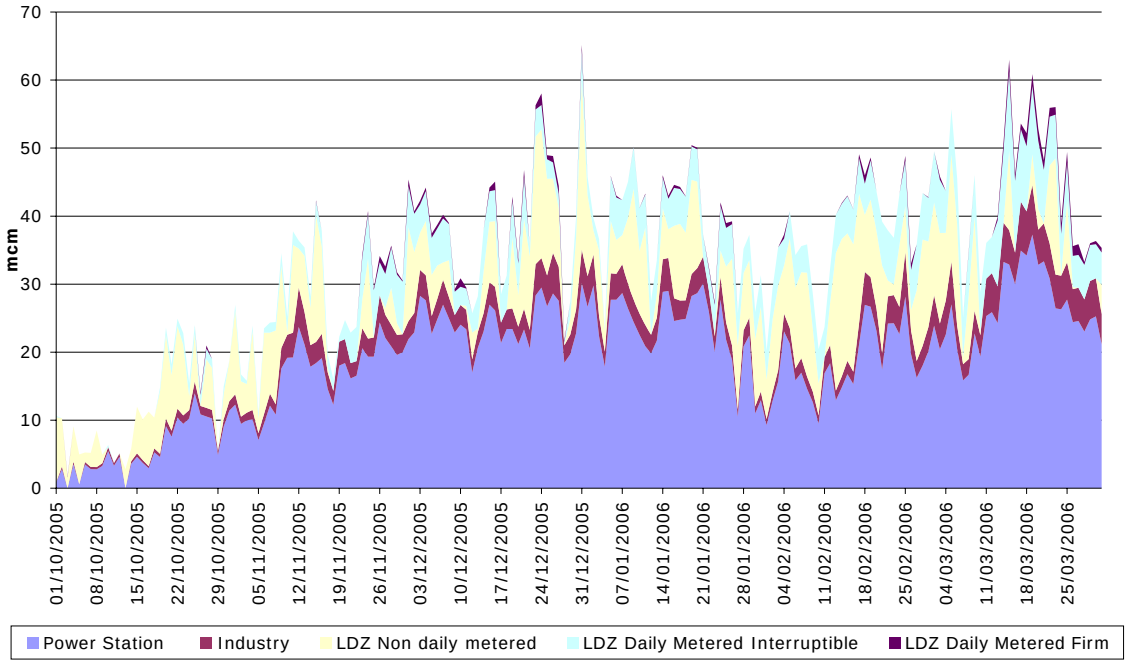
- the requirement in some European countries to hold strategic storage stocks so that even if UK prices are higher than European prices the gas is not available to flow.

1.33. However, as there will in future be interconnectors with three different jurisdictions, this risk will be reduced.

Demand-side response

1.34. The third source of flexibility available to the GB gas market comes from the demand side. Figure 1.7 shows the level of demand-side response that has occurred in the GB market this winter. The majority of demand-side response has historically come from the power sector but Ofgem has been working closely with customers to remove the barriers to them providing this service. In particular Ofgem, National Grid and customers developed and implemented the Gas Balancing Alert for this winter which allowed National Grid to signal a physical shortage of gas to customers and provided an indication to customers to engage in demand-side response.

Figure 1.7 Total Demand Side Response 2005/06



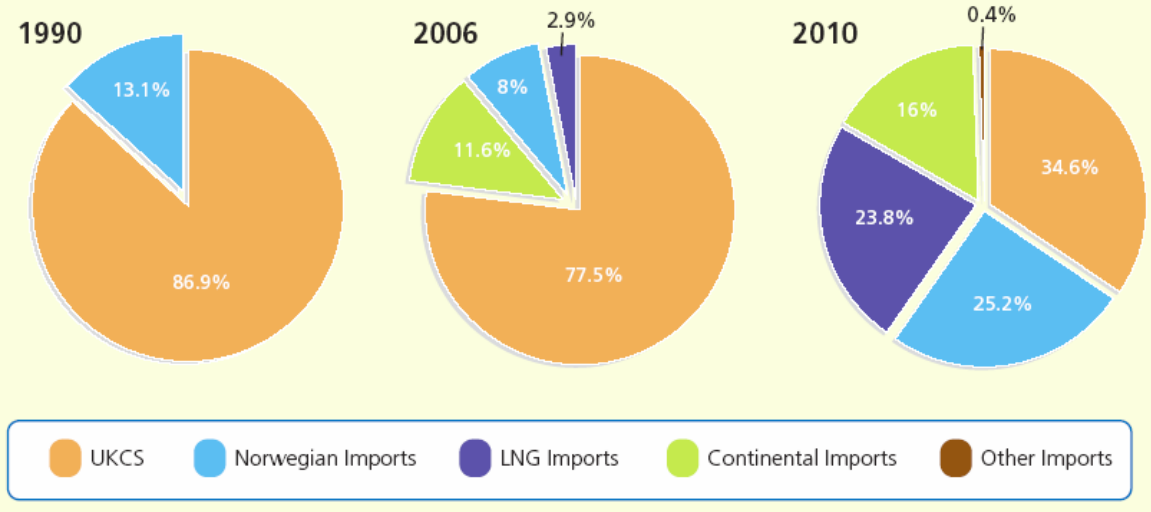
Source: National Grid.

1.35. An example of how the market was able to draw on the tools available to it to respond to a significant unforeseen event is the recent unplanned outage at Rough. On 16 February 2006 a fire occurred on an offshore platform which was used to inject and withdraw gas from the storage facility. The fire and resultant damage led to the complete shut down of the facility (the outage is ongoing and the facility is expected to return on 01 June 2006). The impact of this outage on gas supplies has been significant (in the 3 months leading up to the outage supplies from Rough accounted for 5% of gas supplied to the market and for 10% on the peak demand day this winter). During a cold snap following the Rough fire, when levels of demand and prices were high, the market responded with higher flows from other storage facilities, flows from LNG storage and, as has been a common theme throughout the winter, high levels of demand-side response.

Do markets deliver diverse supplies?

1.36. Diversity of supply in gas can be shown in terms of the different supply sources that make up total supply. The pie charts in Figure 1.8 shows that in 1990 all of UK gas supply was made up from the UKCS and Norwegian imports. By 2006 2.9% is sourced from LNG, and 11.6% from continental imports, and the combined share of UK and Norwegian gas has fallen to 85.5%. By 2010, the proportion of LNG imports is expected to increase to 23.8% while continental imports are expected to increase to 16% of GB supply, as UKCS supply declines.

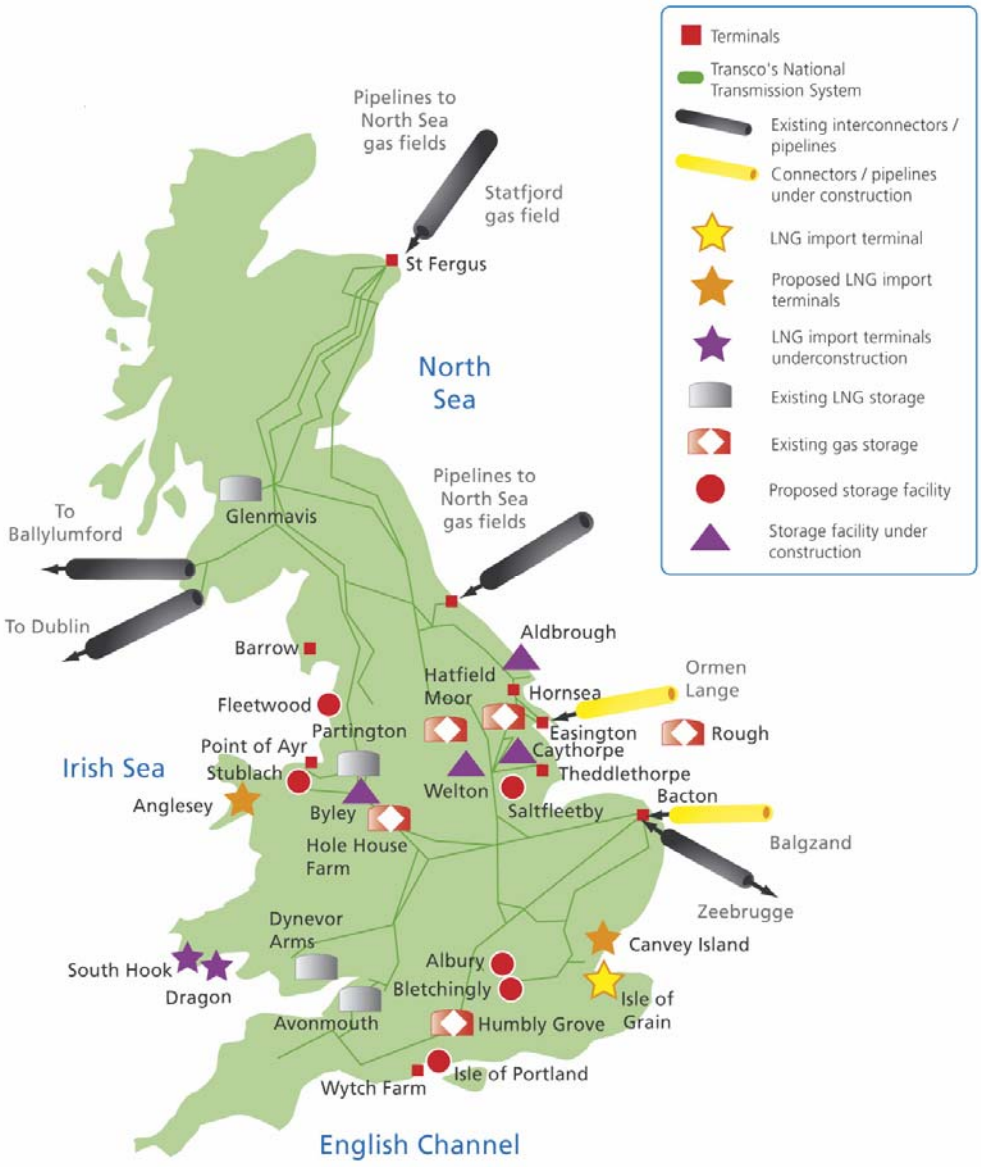
Figure 1.8 Diversity of Gas Supply in the UK



Source: IEA Statistics Natural Gas Information 2004, National Grid 10 Year Statement 2005, www.kslaw.com.

1.37. This is supported in the level of investment in current projects and planned/proposed projects over the next five years. Current investment projects are shown in Figure 1.9. This shows the range of projects that will deliver gas to the UK market in the period up to 2010.

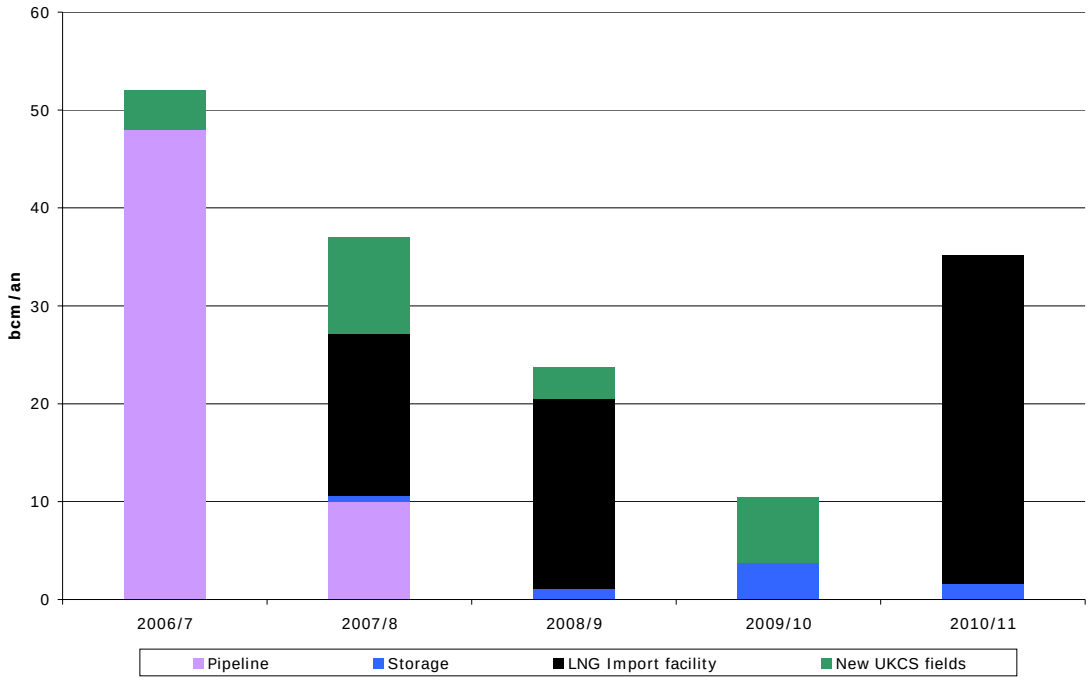
Figure 1.9 Current Investment Projects



Source: Ofgem Fact Sheet.

1.38. In addition there are also planned/proposed projects which have a lower level of certainty on delivery/timing. Including these, there is a total of 60 projects, of which 43 are proposed new fields on the UKCS, 11 are new storage projects, 2 new LNG import facilities and 4 are new import (or interconnector) projects by 2010. Figure 1.10 shows the current view of when this capacity will come on stream. All of this investment is private and has been initiated in response to the increase in prices observed. It is unclear how central planners would have responded, but there is no reason to believe that they would have foreseen the decline in UKCS, or that they would make more efficient investment decisions.

Figure 1.10: Current investment and Planned / proposed future supply projects, annual capacity



Source: Ofgem Analysis.

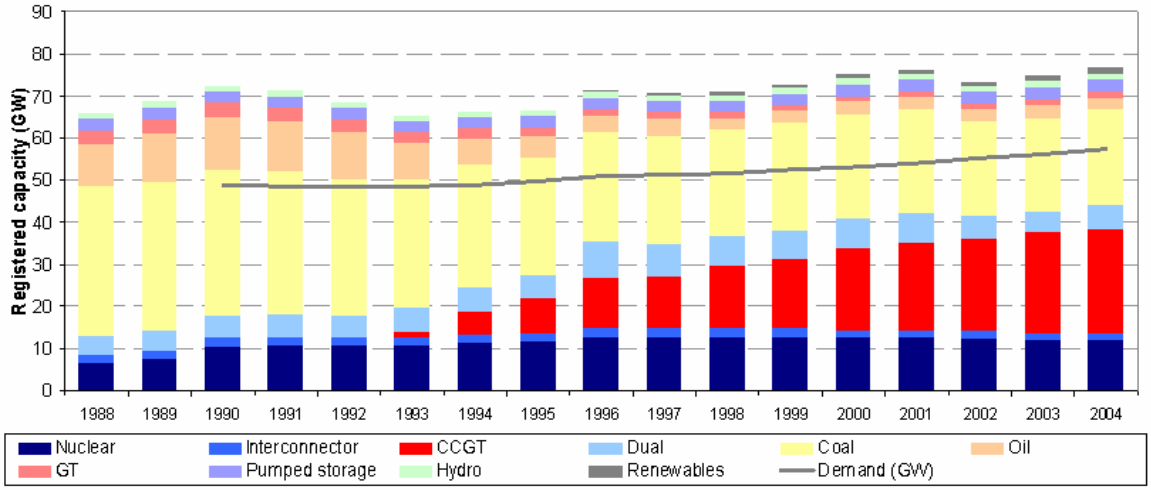
1.39. However, increasing the range of countries from which gas is sourced may increase political risk due to supplies being suspended from a particular geographical region due to regime change, warfare or other political reasons. The programme of investment which is currently underway in the GB gas market (and across Europe as a whole) will enable gas to be sourced for Britain from a variety of sources either in the form of pipeline gas or LNG.

Electricity

Do markets invest on time?

1.40. Historically the UK has invested in sufficient generation capacity to ensure secure supplies. This is typically shown in the reserve margin - or the amount of available generation capacity available in excess of demand. Figure 1.11 shows the UK electricity position from 1988 to 2004. During this time the average margin of capacity over demand has been in excess of 15%, rising to over 20% since October 2003.

Figure 1.11: The UK Electricity Position

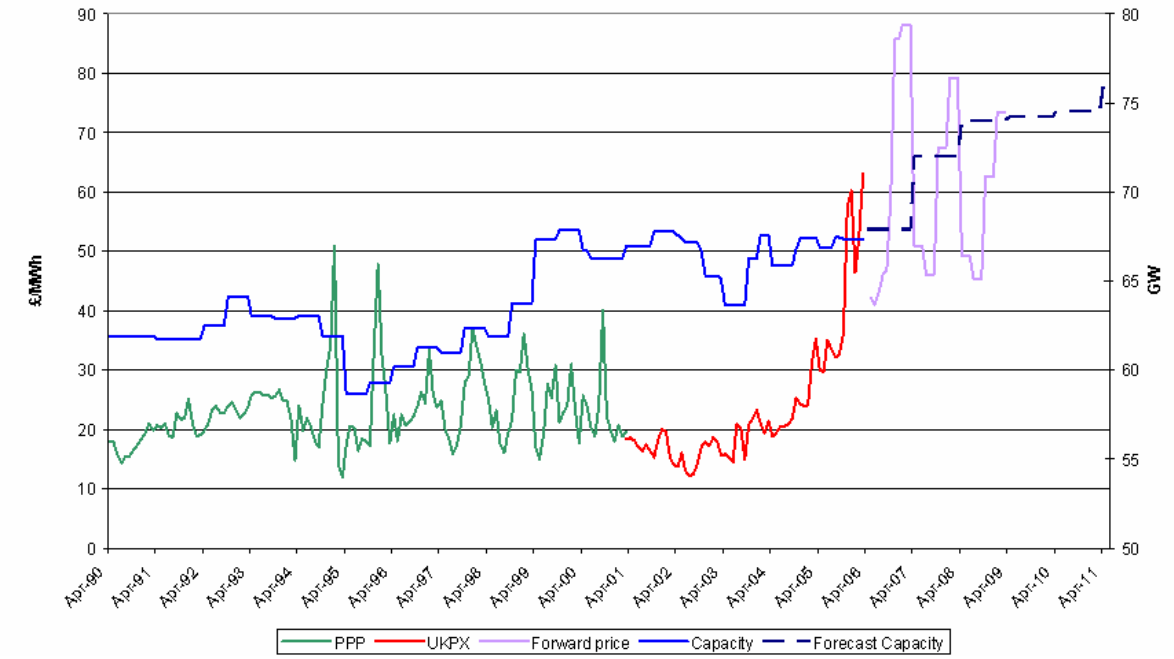


Source: DTI, Digest of UK Energy Statistics.

1.41. Although total capacity over this time appears to be relatively constant, a significant number of plants have been retired and have been replaced with new generation. Therefore the market has delivered the required investment. This has amounted to 29GW of new generation plant and £12.5bn private investment.

1.42. Figure 1.12 illustrates the way in which investors in the electricity market have responded to price signals. From 1995 to 2001 there was considerable volatility in electricity prices. During this time capacity increased by around 10.5GW. In addition, between 2004 and 2006 there has been a sustained increase in electricity prices as well as significant volatility in the forward market and the market has responded with a planned increase in capacity of around 12.6 GW by 2010.

Figure 1.12 Electricity prices and generation capacity



Source: National Grid Seven Year Statement, APX.

1.43. While CCGT generation continues to be an important power source going forward, there are also significant amounts of increased interconnection and wind generation. Figure 1.13 shows planned projects to increase electricity supply and corresponding plant type mix.

Figure 1.13 Planned Generation Capacity by Fuel Type

Source: National Grid website.

Do markets invest to manage small probability/high impact events?

1.44. Historically the GB electricity market has met short term peaks in demand requirements by using either spinning reserve, plant that is already running and can be brought on to the system quickly; or highly flexible peaking plant that can respond quickly to changes in system requirements, such as OCGT and pumped storage.

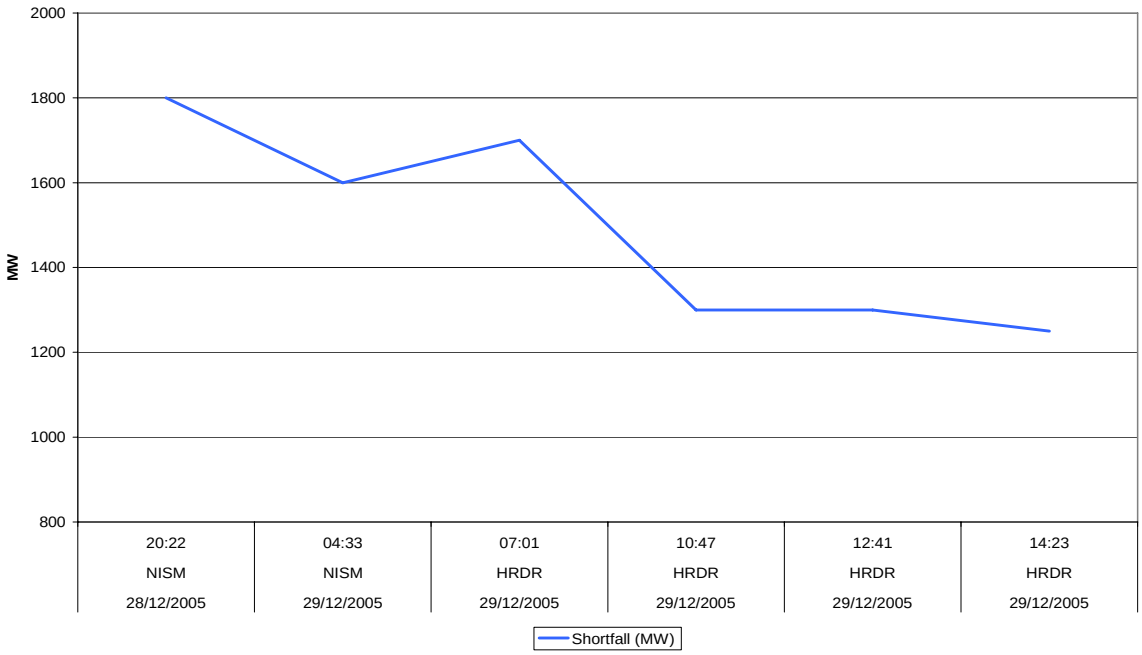
1.45. The System Operator (SO) has three types of tools at its disposal:

- Market-based: the SO can either buy/sell gas in the Balancing Mechanism (this Mechanism manages the need for flexibility in the GB electricity market. It is a mechanism to ensure that demand and supply are matched in every half hour period);
- Market-based: the SO can contract to procure reserve margin from market participants; and
- Physical: the SO can provide system warnings that communicate to the market the need to hold off outages, bring more plant online and review imbalance positions. Examples of such warnings are the Notice of Insufficient Margin (NISM) and High Risk of Demand Reduction (HRDR).

1.46. The SO is incentivised by Ofgem to maintain system balance at the lowest cost possible. Each year, Ofgem develops and implements an incentive scheme that sets a target level of costs for the SO to balance the system and allows the operator to keep a proportion of any savings that it can make against this target, thus providing the operator with a strong incentive to minimise market balancing costs.

1.47. Historically, these tools have been sufficient to deal with supply disruptions. An example would be the market's response to the NISM issued on the morning of 28 December 2005 for the hours between 16:30 to 18:30 on the next day. Figure 1.14 shows the consecutive reduction in operating margin shortfall in response to the notices. As a result of the NISM, HRDR and resulting market response, demand was met by supply via both decaying reserve requirements and lower demand outturn.

Figure 1.14 System Response to NISM and HRDR on 28/29 December 2005



Source: National Grid.

1.48. Participants in the GB electricity market have a range of tools to achieve flexibility and, as a result of price signals in the balancing mechanism, have invested in plant to achieve this. These tools include:

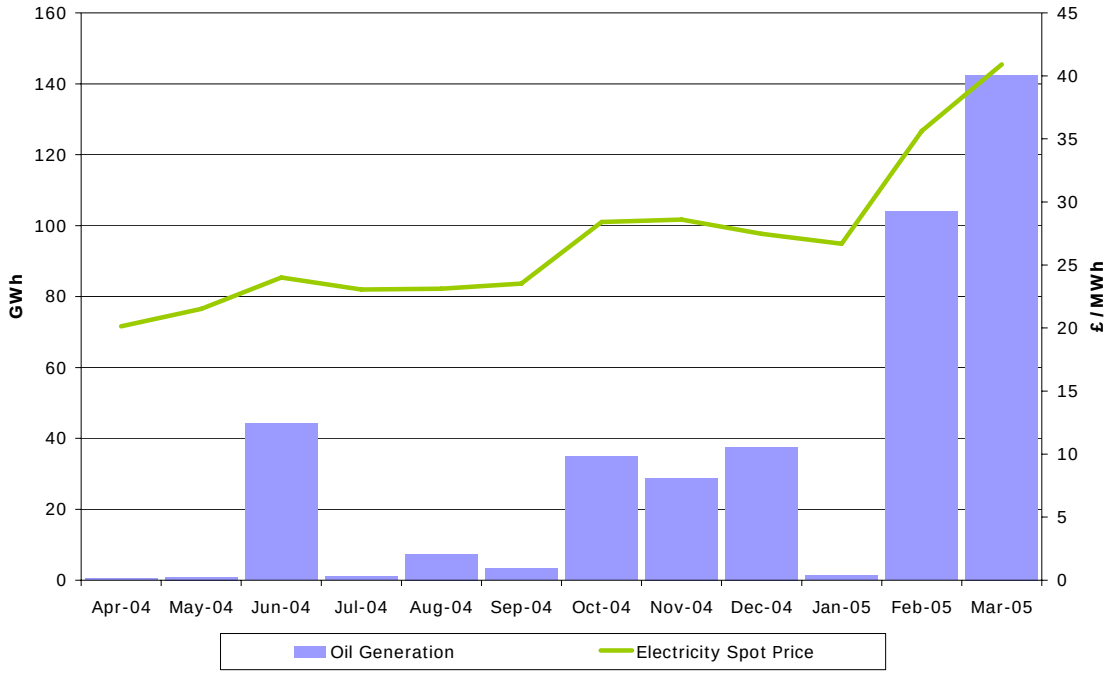
- the use of peaking plant or plant that is able to respond quickly to changes in demand and/or supply;
- reserve margin or the amount of generating capacity that is available to meet demand;
- demand side response.

1.49. In the sections below we look at each of these options in turn.

Peaking plant

1.50. Peaking plant is generation capacity that comes on to the system at short notice when it is needed to meet demand. A number of types of generation can act as peaking plant; however one of the major sources is oil.

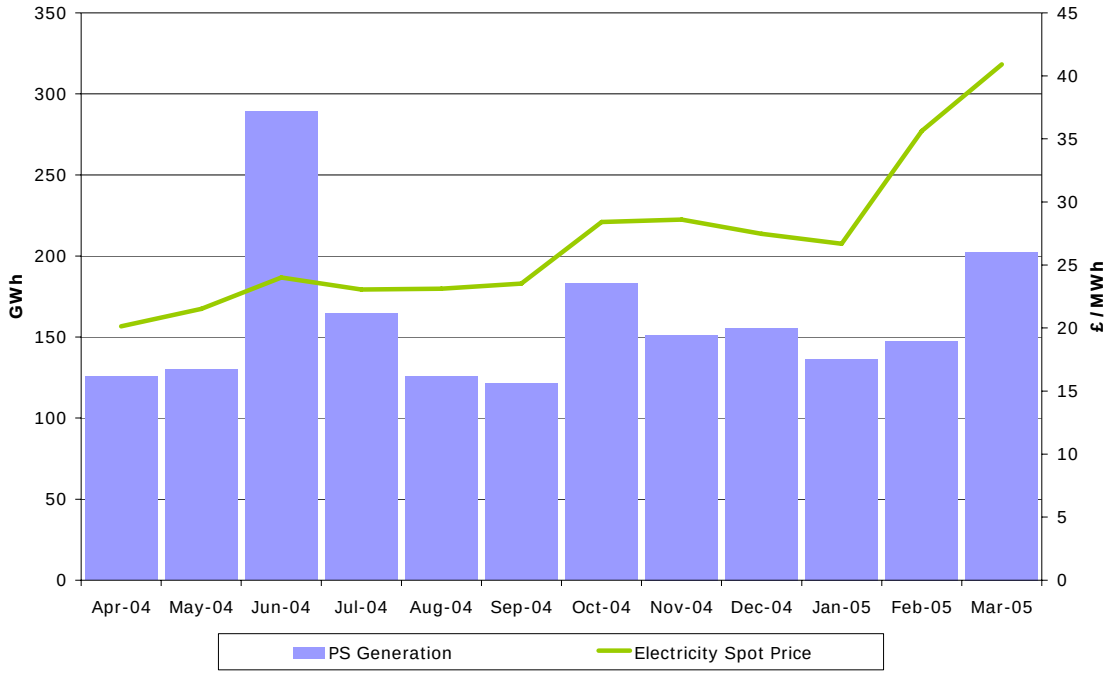
Figure 1.15 Oil Fired Electricity Generation 2004/05



Source: National Grid, Elexon.

1.51. Figure 1.15 shows that as price increases, oil-fired generation responds with increased output. The same applies to pumped storage, as seen in figure 1.16.

Figure 1.16 Pumped Storage Generation 2004/05

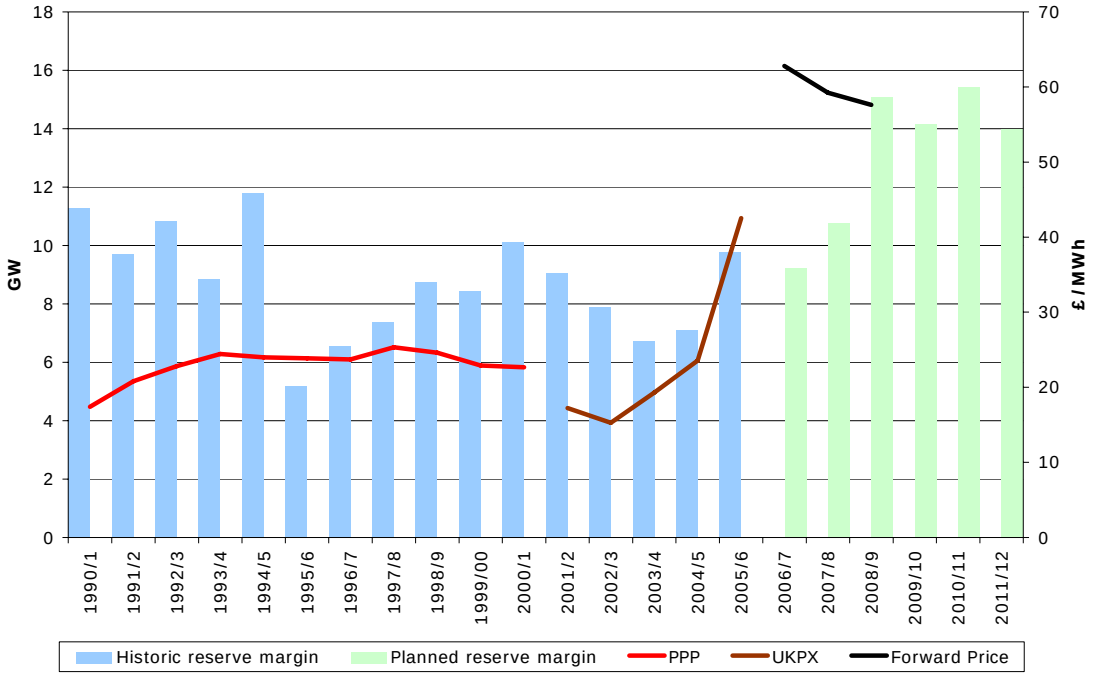


Source: National Grid, Elexon.

Reserve Margin

1.52. Reserve margin is the excess of available capacity over peak demand. The graph below in figure 1.17 shows that market participants have invested in sufficient plant to provide adequate levels of margin in response to price.

Figure 1.17 System Reserve Margin

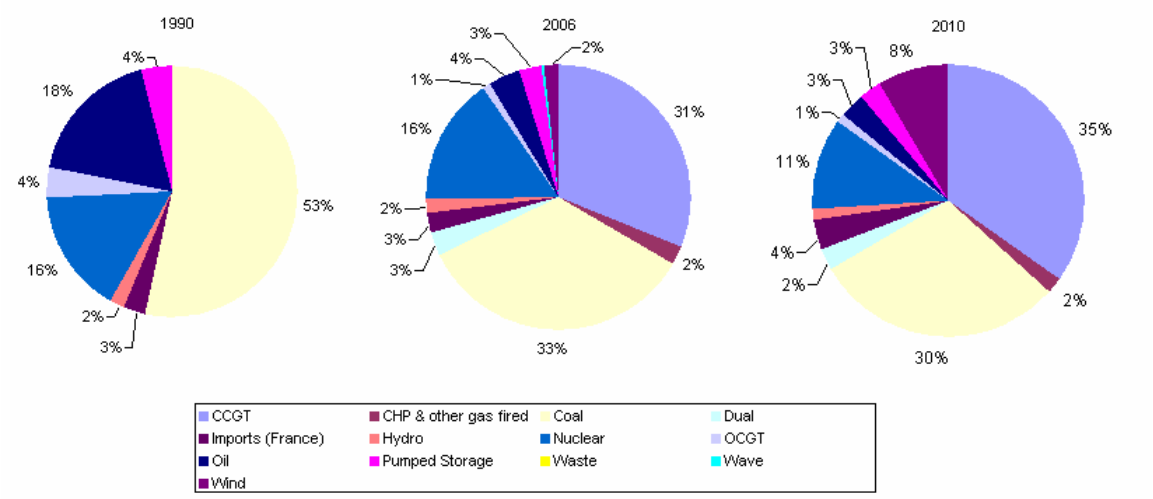


Source: Heren, APX, NGT.

Do markets deliver diverse supplies?

1.53. Diversity of supply in electricity can be shown in terms of the different sources of generation that make up supply. The pie charts in Figure 1.18 show the development of sources of supply.

Figure 1.18: The development of sources of supply



Source: National Grid Seven Year Statement 2005 and updates.

1.54. The development of the system, in terms of both past and future build, demonstrates that private investors are prepared to invest in a range of technologies:

- in 1990, 53% of generation came from coal, with 18% from oil and 16% nuclear. Other sources were hydro, imports, OCGT and pumped storage, each contributing 4% or less;
- by 2006, private investment has driven the development of a more diverse electricity supply with no fuel contributing more than a third to the overall supply mix. Coal's share of the fuel mix has declined to 33% and oil to 4%, whilst nuclear remains at 16% and CCGT has increased to 31%. Other sources are still small, not contributing more than 4% each. Although renewables have entered the fuel mix, this is largely due to incentive schemes such as ROCs; and
- by 2010, including new generation that is already planned under transmission contracts, the current diversity of the fuel mix will be maintained. The major change is that the role of renewables, and in particular wind, is growing and there will likely be a slight decrease in coal and nuclear.

1.55. Although no new nuclear generation has been built by the market since privatisation (Sizewell B was planned and developed prior to market liberalisation), it is clear that there is interest in investing in new nuclear plant. In this regard, a number of companies have expressed an interest in investing in new nuclear capacity in Britain in the future.[13]

Supporting Data

Data Tables - Gas

Table 1.1: GB self sufficiency in gas

Year	Total Natural Gas Import	Total Natural gas Export	Difference
2000	26,032	- 146,342	-120,310
2001	30,464	- 138,330	-107,866
2002	60,493	- 150,731	-90,238
2003	86,298	- 177,039	-90,741
2004	133,035	- 114,111	18,924

Source: DTI, Digest of UK Energy Statistics (DUKES 2005).

[13] Source http://www.eon-uk.com/Content/Media/news_detail.aspx?NewsId=911, "French to cash in with nuclear UK" Tom McGhie, Mail on Sunday,15 January 2006

Table 1.2: Current Storage Facilities

Year commissioned	Storage facility	Company	Space (mcm)	Deliverability (mcm)	Injectability (mcm)
1983	Rough	Centrica Storage Limited	3,217	42	15
1979	Hornsea	Scottish and Southern Energy (SSE)	316	18	2
2002	Hatfield Moor	Scottish Power	116	2	2
2001-3	Hole House (Phase 1)	Energy merchants Gas Storage (UK)	28	3	6
Nov-05	Humbley Grove	Star Energy Ltd	290.5	7.2	8.4
LNG Storage					
1978	Avonmouth	National Grid	81	14	0
1983	Dynevor Arms	National Grid	28	5	0
1971-5	Glenmavis	National Grid	47	9	0
1972	Partington	National Grid	104	20	0

Source: Ofgem's submission to the European Commission (DG TREN) Report 2005, National Grid LNG Storage, National Grid[14], Star Energy

[14] http://www.nationalgrid.com/uk/Gas/lngstorage/Capacity

Table 1.3: UK Import projects

Year	Import Project	Developer	Capacity (bcm/year)	Status
Dec 2006	Belgium Interconnector (Phase 2)	IUK	Additional 7	Under construction.
2006/7	Langeled	Gassco	25	Under construction, pipeline completion late 2006, first flow from Ormen Lange late 2007
2007/8	Tampen Link (FLAGS. Statfjord late life project)	Gassco	~10	Construction contract awarded
2007/8	Dutch Interconnector (BBL)	BBL	16	Under construction

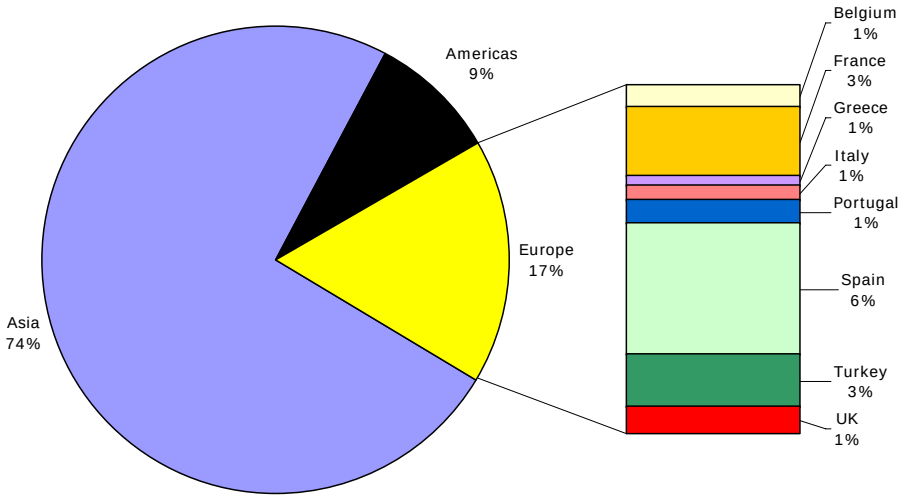
Source: NG Ten Year Statement 2005.

Table 1.4: Future LNG Import Facilities

Year	Import project	Location	Developer	Size bcm/annum	Status
2006/7	Teesside GasPort	Teesside	Excelerate	7.2	Seeking planning permission
2007/8	Dragon LNG	Milford Haven	Petroplus / BG / Petronas	6	Under construction, possibility of additional 6 bcm later expansion
2007/8	South Hook LNG (Phase 1)	Milford Haven	Qatar Petroleum / Exxon Mobil	10.5	Under construction
2008/9	Isle of Grain (Phase 2)	Isle of Grain	National Grid	9	Phase 2 construction contract awarded
2008/9	South Hook LNG (Phase 2)	Milford Haven	Qatar Petroleum/ Exxon Mobil	10.5	Construction contract awarded
2010/11	Canvey LNG	Canvey Island	Calor Gas, Centrica, Japan LNG	5.4	Initial stages of development
2010/11	Amlwch LNG	Isle of Anglesey	Canatxx	15	Initial stages of development
2010/11	Teesside LNG	Teesside	Norsea Pipeline Ltd	6.2	Seeking planning permission
2010/11+	Gateway LNG	East Irish Sea	Stag Energy	7	Construction start 2007/08

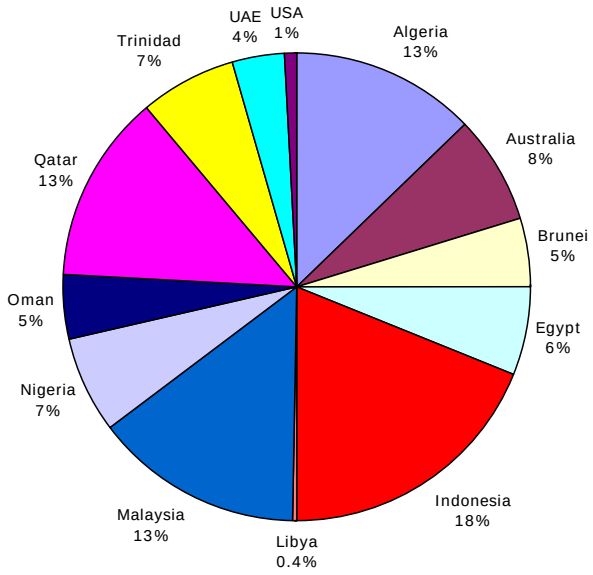
Source: NG Ten Year Statement 2005; Gateway LNG Fact Sheet.

Figure 1.19: LNG import capacity



Source: Natural gas information 2005 - IEA, http://www.kslaw.com/library/pdf/LNG_in_Europe.pdf, http://www.energy.ca.gov/lng/documents/2005-08_EXISTING_LNG_REGAS_IMPORT_WORLDWIDE.PDF, http://www.petronetlng.com/lngterminals.htm, http://www.ferc.gov/industries/lng/indus-act/terminals/exist-prop-lng.pdf.

Figure 1.20 LNG export capacity



Source: Natural gas information 2005 - IEA,http://www.energy.ca.gov/lng/documents/2005-08_EXISTING_LNG_EXPORT_WORLDWIDE.PDF.

Table 1.5: National Grid's supply and demand forecasts for 2004/5 to 20014/15

Year	Supply forecast (bcm)						Demand forecast
	UKCS Forecast	Norwegian Imports	LNG Imports*	Continental Imports	Other Imports**	Total	
2004/5	86	8	0	6	0	101	98
2005/6	80	8	3	12	0	103	100
2006/7	78	27	3	30	0	138	102
2007/8	76	47	16	30	0	169	103
2008/9	71	47	23	30	0	170	105
2009/10	65	47	35	30	1	177	108
2010/11	60	47	35	30	8	179	110
2011/12	55	47	35	30	16	182	114
2012/13	47	47	35	30	30	188	118
2013/14	38	47	35	30	48	197	121
2014/15	24	47	35	30	48	184	125

* Figures based on imports into Milford Haven and Grain.
**Other Imports includes LNG projects not yet under construction. However this does not include all possible and planned projects.

Source: National Grid Ten Year Statement.

Table 1.6: Reserve margin for 2004/5 to 20014/15

Year	Reserve Margin		Margin after loss of LNG		Margin losing Belgium/NL	
	bcm	%	bcm	%	bcm	%
2004/5	3	3%	3	3%	-3	-3%
2005/6	3	3%	0	0%	-9	-9%
2006/7	36	35%	33	32%	6	6%
2007/8	65	63%	50	48%	35	34%
2008/9	66	63%	43	41%	36	34%
2009/10	70	65%	35	33%	39	36%
2010/11	69	62%	34	31%	31	28%
2011/12	68	60%	34	30%	23	20%
2012/13	71	60%	36	31%	11	9%
2013/14	75	62%	41	34%	-2	-2%
2014/15	59	47%	24	19%	-19	-15%

Source: Ofgem calculation.

Table 1.7: Future Storage Projects

Year	Storage project	Developer	Size (mcm)	Deliverability (mcm/day)	Status
2006/7	Hole House (Phase 2)	Energy merchants Gas Storage (UK)	15	3	Under Construction
2007/8	Aldbrough	Statoil/SSE	420	40	Under Construction
2007/8	Caythorpe	Warwick Energy	200	11	Planning permission pending
2008/9	Hole House (Phase 3)	Energy merchants Gas Storage (UK)	15	3	
2008/9	Byley Gas Storage	Eon	165	16	Under Development
2008/9	Welton	Star Energy	435	9	Planning permission pending
2008/9	Albury (Phase 1)	Star Energy	160	11	Initial Stages
2008/9	Portland	Egdon Resources	300+	27*	Initial Stages
2009/10	Bletchingley	Star Energy	~875	78*	Conceptual
2009/10	Stublach	Ineos Enterprises	550	49*	Initial Stages
2009/10	Saltfleetby	Wingas	600+	54*	Initial Stages
2009/10	Fleetwood	Canatxx	1,700	114	Public enquiry
2010/11	Albury (Phase 2)	Star Energy	~715	11	Conceptual
2010/11	Gateway (salt cavern)	Stag Energy	270	25	Conceptual
2010/11	Gateway (depleted gas field)	Stag Energy	700	6	Conceptual

Source: National Grid 10 Year Statement 2005, Gateway Project Fact Sheet, UK GAS REPORT/ISSUE 290/8 AUGUST 2005, Platts,

(http://www.powerdat.com/Content/Natural%20Gas/highlights/2006/UKGasTracker.pdf)

* Ofgem estimate.

Data Tables - Electricity

Table 1.8: GB Installed Capacity 1990

Plant Type	Capacity (MW)	Percentage
CCGT	-	0%
CHP & other gas fired	-	0%
Coal	39,613	53%
France	2,000	3%
Hydro	1,306	2%
Nuclear	11,953	16%
OCGT	3,052	4%
Oil	13,369	18%
Pumped Storage	2,788	4%
Waste	-	0%
Wave	-	0%
Wind	4	0%
Total	74,085	

Sources: The two Scottish Electricity companies Share Offers prospectus 1991; SSEB Report and Accounts 1989; Scottish Nuclear Report and Accounts 1990; http://www.ukaea.org.uk/; Scottish Hydro Annual Report 1987.

Table 1.9: Capacity commissioned in GB since 1990

Year	Capacity (MW)							
	CCGT	CHP & other gas fired	Coal	Nuclear (PWR)	OCGT	Waste	Wind	Total by year
1991/2	229	-	-	-	-	-	-	229
1992/3	2,775	300	-	-	-	-	-	3,075
1993/4	2,609	-	-	-	-	-	-	2,609
1994/5	3,132	16	-	1,190	-	-	-	4,338
1995/6	680	-	-	-	-	-	15	695
1996/7	3,239	-	-	-	140	-	-	3,379
1997/8	1,498	-	-	-	-	-	25	1,523
1998/9	2,381	-	-	-	-	-	-	2,381
1999/00	1,491	-	-	-	158	8	8	1,665
2000/1	3,557	-	363	-	-	12	-	3,932
2001/2	740	120	-	-	-	-	45	905
2002/3	552	-	-	-	-	-	103	655
2003/4	-	-	-	-	-	-	-	-
2004/5	1,611	-	-	-	-	-	566	2,177
2005/6	890	-	-	-	-	-	960	1,850
Total by Fuel type	25,384	436	363	1,190	298	20	1,722	29,413

Source: National Grid's Seven year statement 2005: Table 3.6. Commissioning dates for generation located in Scotland were taken from the two Scottish Electricity companies' share offer prospectuses 1991, BWEA and company websites.

Table 1.10: Examples of investment in plant refurbishment since 1990

Year	Station	Company	Capacity (MW)	Cost (£m)	Comments
1990/1	Foyers	SSE	300	7.6	Plant had exceeded its plant life
1991/2				5.8	
2000/1	Peterhead	SSE		220	Re-powering to double station efficiency
2000/1	Uskmouth	AES[15]	363	100	Should be able to operate for another 25 years
2004/5	Aberthaw	Innogy	1500	45	Replacement steam turbines
2004/5	Pitlochry	SSE	15	250	
2004/5 onwards	All hydro assets	SSE	1,200	233	To extend the life of the assets
2005/6	Shin, Sutherland, Quoich	SSE	42	1.7	

Source: Company websites.

15 The plant is now owned by Carron.

Table 1.11: Investment in the fitting of Flue Gas Desulphurisation

Year	Station	Company	Capacity (MW)	Cost £m
1995/6	Ratcliffe	Powergen	2000	250[16]
1996/7	Drax	Drax	3850	650[17]
2001/2	Uksmouth	Carron	360	38.7[18]
2002/3	Cottam	EDF	1000	100[19]
2002/3	West Burton	EDF	2000	130[20]
2005/6	Eggborough	British Energy	1000	60[21]
Total			3850	1229

Source: See footnotes

Table 1.12: GB installed capacity 2006

Plant Type	Capacity (MW)	Percentage
CCGT	23,762	31%
CHP & other gas fired	1,743	2%
Coal	26,398	34%
Dual	2,109	3%
External	1,988	3%
Hydro	1,159	2%
Nuclear	11,904	16%
OCGT	1,017	1%
Oil	2,796	4%
Pumped Storage	2,290	3%
Waste	29	0%
Wave	7	0%
Wind	1,377	2%
Total	76,579	

Source: NGC SYS 2005, Table 3.6 updated using the Quarterly updates published in May, August and October 2005 and January 2006.

16 http://www.parliament.the-stationery-office.co.uk/pa/cm199899/cmhansrd/vo990208/text/90208w13.htm.
17 http://www.draxpower.com/files/BATNEEC__&_BPEO.doc.
18 Ofgem estimate based on cost analysis carried out by the Welsh Assembly, http://www.yhassembly.gov.uk/p_contentDocs/363_1.pdf.
19 http://www.environment-agency.gov.uk/commondata/acrobat/lowertrentanderewash2_573118.pdf.
20 http://www.environment-agency.gov.uk/commondata/acrobat/lowertrentanderewash2_573118.pdf.
21 http://www.industcards.com/st-coal-uk-eng.htm.

Table 1.13: Details of mothballed generation capacity in England and Wales

Year	Date from	Date to	Station	Company	Capacity (MW)
2002/3	Apr-02	Sep-02	Dinorwig 4	International Power	288
	Apr-02	Oct-02	Dinorwig 6	International Power	288
	Apr-02	Oct-03	Deeside	International Power	250
	Apr-02	Nov-03	Fifoots 13 (now Uskmouth)	Administrators	120
	Mar-02	Nov-03	Fifoots 14 (now Uskmouth)	Administrators	120
	Mar-02	Nov-04	Fifoots 15 (now Uskmouth)	Administrators	120
	Apr-02	Oct-03	Killingholme PG1	Powergen	450
	Apr-02	Oct-03	Killingholme PG2	Powergen	450
	Dec-02	Mar-04	Killingholme NRG	Powergen	220
	Nov-02	Nov-03	Grain 4	Powergen	675
2003/4	Apr-03	Aug-03	Dinorwig 2	International Power	288
	Apr-03	Jul-03	Dinorwig 3	International Power	288
	Apr-03	Sep-03	Ffestiniog 3	International Power	90
	Apr-03	Sep-03	Grain 1	Powergen	675
2004/5	Apr-04	Apr-05	Killingholme PG1	Powergen	450
	Apr-04	Jul-05	Killingholme PG2	Powergen	450
	Apr-04	Oct-04	Dinorwig 1	International Power	288
	Apr-04	Oct-04	Dinorwig 5	International Power	288

Source: National Grid Seven Year Statements and Quarterly updates.

Table 1.14: Plant closures notified to National Grid

Closure Year	Station Name	Company	Plant Type	Capacity (MW)
2007/8	Dungeness A	Magnox Electric plc	Nuclear Magnox	440
2007/8	Sizewell A			458
2008/9	Oldbury			470
2010/11	Wylfa			1006

Source: National Grid Seven Year Statement 2005: Table 3.10, Updated using the January 2006 update to its 2005 Seven Year Statement.

Table 1.15: New generation plant 2005/6 to 2011/12 (MW)

Year	CCGT	CHP	Coal	Hydro	Inter-connector	OCGT	Tidal	Wind	Total by year
2005/6	1,780	-	-	-	-	-	-	632	2,412
2006/7	-	-	-	-	-	-	-	885	885
2007/8	1,650	-	-	-	-	-	-	945	2,595
2008/9	2,995	-	-	100	600	-	-	2,575	6,270
2009/10	-	-	-	-	200	-	-	250	450
Total by plant type	6,425	0	0	100	800	0	0	7,287	12,612

Source: NGC SYS 2005, Table 3.7 updated using the Quarterly updates published in May, August and October 2005 and January 2006.

Appendix 3 - Energy Markets and the Carbon Challenge

1.1. Chapter 4 sets out the scale of the climate change challenge faced by the UK as well as Ofgem's suggested policy response. This appendix sets out some more detail on the issues raised in the main chapter. The first section looks at the international context and the UK's commitments and recent emission levels. The following sections look at how to achieve cost effective emission reductions in the UK and the role that the energy sector could play in delivering emission reductions. Finally, there is a discussion of policy options, including options for improving the functioning of the EU Emissions Trading Scheme (EU ETS) and alternatives such as carbon contracts.

The Context

1.2. The UK government has committed to a number of international and domestic targets and goals to reduce emissions of greenhouse gases which contribute to climate change.

1.3. The key international agreements are the 1992 United Nations Framework Convention on Climate Change (UNFCCC), and the 1997 Kyoto Protocol. The main objective of the UNFCCC is to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic climate change while the Kyoto Protocol sets out specific targets for developed countries to reduce their emissions of greenhouse gases.[22] The overall target was a reduction in greenhouse gas emissions of 5.2% below the base year over the period 2008-2012.[23] The then 15 Member States of the EU agreed a collective target of an 8% reduction and, within this, the UK agreed to a legally binding target of a 12.5% reduction.

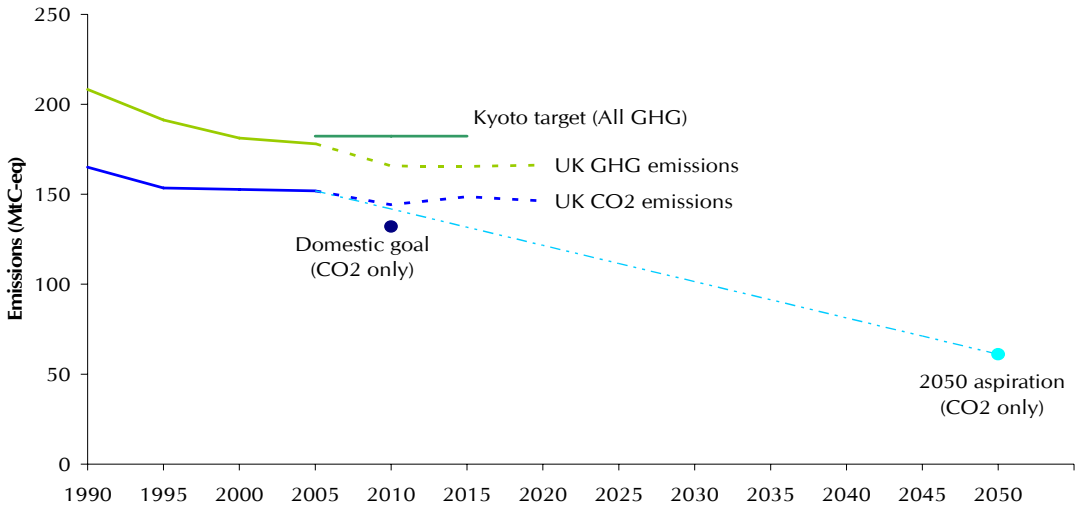
1.4. In addition to the targets set out in the international agreements, the UK has made two further commitments, which are not legally binding:

- to reduce emissions of carbon dioxide to 20% below 1990 levels by 2010; and
- to put the UK on a path to reduce carbon dioxide emissions by 60%, compared to 2000 levels, by 2050 with real progress by 2020.

1.5. Figure 1.1 shows recent annual greenhouse gas and carbon dioxide emissions for the UK along with short term projections and highlights the emission levels that would need to be met to achieve the 2050 goal. The UK is currently on track to meet its Kyoto target as emissions of the basket of six greenhouse gases were 14.6% below base year in 2004 and are projected to be 19.6% below base year levels in 2010.

[22] The targets are set on a basket of six greenhouse gases: carbon dioxide (CO2); methane (CH4); nitrous oxide (N2O); hydroflurocarbons (HFCs); perflurocarbons (PFCs); and sulphur hexafluoride (SF6).
[23] The base year is 1990 for carbon dioxide, methane and nitrous oxide and 1995 for the fluorinated compounds.

Figure 1.1 Historic and projected greenhouse gas and carbon dioxide



Source: Based on data from Defra's e-Digest of Environmental Statistics.

1.6. However, the UK is not currently on a clear track to meet its 2010 commitment to reduce carbon dioxide emissions by 20% compared to 1990 levels. Emissions of carbon dioxide were only 5.6% below 1990 levels in 2004. Compared to the recent trend in carbon dioxide emissions, a more rapid reduction in emissions will be required to put the UK on a trajectory to meet the 2050 aspiration, with even more rapid short-term reductions required to meet the 2010 goal.

1.7. The UK contributes just over 2% to current annual emissions of greenhouse gases so even a dramatic cut in UK emissions will have little impact on global emissions. The UNFCCC and the Kyoto Protocol are based on the principle that developed countries should take the lead in reducing emissions of greenhouse gases. Therefore, domestic action to put the UK on a path to a low carbon economy will continue to be an important part of UK climate change policy. However, some developing countries not covered by the Protocol are large contributors to global greenhouse gas emissions despite having very low per capita emissions. Therefore, while the UK may be able to take a lead in tackling climate change, co-ordinated global action will be required to achieve substantial cuts in global emissions.

Cost Effective Emissions Reduction in the UK

1.8. As the largest single carbon dioxide emitting sector, the energy sector will have a critical role to play in meeting UK targets. The UK energy supply sector, largely electricity generation, accounted for almost 40% of UK CO_2 emissions in 2004. According to the Climate Change Programme 2006, UK carbon dioxide emissions are likely to fall from 152.5 MtC in 2004 to 146.6 MtC in 2020[24]. Annual emissions from the energy supply sector are anticipated to fall by around 9 MtC but emissions from

[24] Climate Change: The UK Programme 2006, Defra, March 2006.

both the business and transport sectors are likely to grow by around 3 MtC each. Exploiting the most cost-effective abatement measures across the economy as a whole will be essential for meeting long term targets at reasonable cost, which means sectors such as business and transport need to have their own incentives to reduce greenhouse gas emissions.

1.9. The energy sector can contribute to meeting emissions reductions targets in two ways:

- the demand side, eg. investment in energy efficiency measures to reduce demand for energy; and
- the supply side eg. investing in less carbon intensive generation technologies.

1.10. Meeting climate change targets will require investment in more expensive technologies than market participants might otherwise undertake. Therefore, climate change policies must be designed to be cost-effective in order to minimise energy price increases and the adverse effects that this could have on UK competitiveness and fuel poverty.

Delivering emissions reduction through the demand side

1.11. Demand-side measures aim to reduce greenhouse gas emissions by encouraging consumers to be more energy efficient and to reduce consumption of energy. Greater energy efficiency can itself bring other benefits, such as reducing fuel poverty and contributing to security of supply.

Energy efficiency programmes

1.12. In the initial Climate Change Programme document, published in 2000, the Government put forward a programme that was designed to ensure that each sector contributed to its emissions reduction target through greater energy efficiency. These were:

- the Climate Change Levy (CCL) and Climate Change Agreements (CCAs) in respect of the business sector;
- the Energy Efficiency Commitment in respect of the domestic sector; and
- CHP programmes.

1.13. Of the sectors that fall outside the EU ETS, the residential sector is responsible for a large share of the remaining carbon dioxide emissions. Ofgem is responsible for administering the Government's Energy Efficiency Commitment (EEC), an obligation on gas and electricity suppliers to improve the energy efficiency of the domestic sector.

1.14. The main policies to reduce emissions from the industrial sectors are the Climate Change Levy, the CCAs and the enhanced capital allowances, administered by the Carbon Trust. In the service sector the Climate Change Levy is the main instrument to curb emissions. The majority of emissions from transport derive from road transport. Measures to reduce emissions include a voluntary agreement

amongst manufacturers to limit the emissions per vehicle and, in the past, a price signal, in the form of the Road Fuel Duty Escalator, has been used.

Have energy efficiency measures curbed emissions?

1.15. Household carbon dioxide emissions have risen since 1990, despite an increase in the stringency of the regulations that govern the minimum standards of boilers and appliances and an increase in the scale of the energy efficiency programmes. Analysis carried out by the Energy Saving Trust suggests that these programmes have curbed the growth in energy demand in the domestic sector rather than reduced it. As consumers have become wealthier, they have increased their demand for energy consuming products. This has undermined further energy saving that could have been achieved.

1.16. The data presented in the Review shows that emissions from the service and industrial sectors have declined since 1990. In the industrial sector this has been driven in part by the CCAs, the Climate Change Levy and the Enhanced Capital Allowances. However, the shift away from heavy industry in the UK to lighter industry has also been a factor.[25] Understanding these effects is important in establishing the real effects on carbon emissions of Government policies.

1.17. The decline in service sector emissions in part reflects the fact that emissions from electricity are allocated to energy supply, so that increases in demand for electricity rather than on-site use of fossil fuels will tend to reduce emissions from the service sector while increasing emissions from the generation sector.

1.18. In transport, the data presented in the Review shows that although demand was flat between 1990 and 1995, emissions since 1995 have continued to increase. The growth in road transport demand between 1995 and 2000 was curbed by the real price increases resulting from the Road Fuel Duty Escalator and after 2000 the sharp increase in the price of oil. Although these price effects have led to a slowing in the rate of growth seen in the 1980s they have not led to a fall in demand. The voluntary agreements in place, which aim to limit the level of emissions per vehicle, have not been successful and it seems unlikely that the manufacturers will reach their stated goals.

How should these policy instruments develop?

1.19. The increasing scale of energy efficiency programmes and the tightening of Building Regulations reflect the fact that households have not historically made investments in energy efficiency improvements that would be cost-effective.

1.20. As the allowance price becomes established in the energy price as a result of the EU ETS it is possible that customers will respond and invest appropriately in energy efficiency measures. This type of response was seen in road transport during the two oil price hikes in 1973 and 1980 and it was possible to observe a slowing in the growth in the demand for road fuels as a result of the road fuel duty escalator.

[25] This may have partially resulted in the transfer of emission sources out of the UK and to other countries.

1.21. However, research by Oxera suggests that there are a variety of factors that affect this, such as the information consumers have about the potential to reduce their demand, even to cost-effective levels. These include high discount rates that they implicitly use when making these types of investments, and the high transaction costs they face in making the investment. Breaking down these barriers and understanding what is driving energy demand in the domestic sector will be important if the Government is to meet its energy efficiency targets.

1.22. Further action can be justified to support energy efficiency. Appropriate measures could include fiscal measures, minimum regulatory standards or EEC type incentives. There are a range of different reasons why consumers are not taking up energy efficiency measures and these will need to be addressed if emission reductions are to be achieved. Different sectors need different solutions to improve energy efficiency.

1.23. However any such targeted programmes need to be specifically and rigorously justified and only pursued if there is evidence that more cost effective emission reduction can be achieved than by the EU ETS. This will involve rigorous analysis of existing measures and of proposals for future measures. This analysis should focus on the specifics of the measures in question; that is, a general recognition that measures other than the EU ETS may be needed does not mean that any such measure is appropriate. The decisions must be on a case-by-case basis.

1.24. We welcome the work by the government which has informed the recent review of the Climate Change Programme and its publication for public scrutiny. Publication of the analysis of existing and future measures that will transparently set out the best estimates of the relative cost effectiveness of alternative measures in achieving climate change objectives will allow full debate of future measures.

The Role of Smart Metering

1.25. One possible gateway to greater engagement of the demand side in energy efficiency is smart metering and the improved consumption information that this may make available to consumers. Smarter meters can provide customers with more information about how much energy they use and when they use it. This may encourage customers to look at ways of being more energy efficient. They may look at ways of cutting back the amount of energy they use or look to use less energy at times of peak demand when it is more expensive to generate. If customers respond in this way this will help reduce the greenhouse gas emissions associated with energy use and production. Reducing demand at peak times could also help promote security of supply.

1.26. Smarter metering may also help to boost efforts to promote the use of microgeneration (for example ground heat pumps, solar panels, small wind turbines and boilers that generate electricity as well as heat) in peoples' homes. Customers wanting to install these technologies will need smarter meters that can measure how much electricity they generate as well as use.

1.27. Many fuel poor customers use prepayment meters that are more expensive than standard meters. Smarter, more innovative prepayment meters may help to

lower costs - particularly if they are more reliable and require less maintenance than existing meters. Energy suppliers could offer improved service to all customers. They could eliminate the need for estimated bills and the costs of manual meter reads and the problems that they can create.

1.28. In February this year, we published a consultation paper to better understand the obstacles to and benefits of greater use of smart meters. The paper marked the start of a major Ofgem initiative to understand the case for introducing smarter metering and to look at what actions, if any, needed to be taken to help unlock potential benefits. It provided an overview of technologies and, as well as outlining emerging themes observed from international experience. The paper then gave a brief overview of the present regulatory and commercial framework, followed by the presentation of a high level quantitative assessment of the potential costs and benefits and outlined a range of policy options. These ranged from trying to make the existing market work more effectively, to more radical options such as obliging suppliers to install smart meters.

1.29. We are currently considering responses to our consultation and policy options for facilitating the development of smart metering. Our full decision document will be published in May this year. Ofgem takes seriously the need to provide leadership on this issue, so that there is consistent progress towards unblocking barriers and ensuring that where consumers value the information that the meter can help provide, there are commercial propositions available to them. Ofgem's May document will provide focus for our efforts on removing barriers to innovation in metering and will in particular include the following:

- Ofgem's plans to work with government on the recently announced pilot study into the use of smart meters and associated feedback devices;
- consultation, as part of the supply licence review, on the scope to relax or reframe the requirement for 2 yearly visual inspection of meters;
- plans for to take forward industry-wide discussions on standardisation to ensure that suppliers' abilities to interact with each other's smart metering platforms do not interfere with the take-up of smart metering; and
- further thinking on steps to encourage customers to take a more active role in managing their energy consumption– thereby helping to stimulate demand for innovative solutions.

Delivering emissions reductions through the supply side

1.30. Delivering emission reductions by reducing the carbon intensity of energy production will require investment in low carbon production technologies. Typically, these will be more expensive than established fossil fuel technologies and energy consumers will have to pay for these investments through their bills. The impact on bills depends on two factors:

- the volume of low carbon output required; and
- the price of low carbon generation compared to the lowest cost alternative.

1.31. These factors will influence the cost of delivering on climate change targets for energy consumers. The more demanding the target for the energy sector, the higher the unit cost of abatement and the higher the cost likely to be passed through to consumers

1.32. The volume of low carbon output required will be determined by the constraint on energy sector emissions resulting from government policy, although effective demand side measures will reduce the volume of abatement required on the supply side. As future targets are likely to set absolute limits on emissions, the stringency of the constraint on the energy supply sector will depend on the volume of abatement delivered by the other sectors and the rate of growth in electricity demand. The more abatement delivered by other sectors, and the greater the reduction in energy demand, the less abatement will need to be delivered by the electricity generation sector to meet a particular constraint. These factors will influence the cost of delivering on climate change targets for energy consumers. The more demanding the target for the energy sector, the higher the unit cost of abatement and the higher the cost likely to be passed through to consumers.

1.33. The price of low carbon generation compared to the lowest cost alternative will vary depending on a range of uncertain factors, including how the capital costs of new technologies change over time; and the price of fossil fuels. Many low carbon technologies are relatively new and capital costs may fall over time as they become more widely used and the technology is proven. The rate at which technology will develop, and which of the potential technologies will prove to be the most cost-effective abatement option is impossible to predict. The technologies also become relatively less expensive if fossil fuel prices increase.

1.34. The more stringent the emissions constraint faced by the electricity generation sector, the higher the marginal cost of meeting the target will be. If the target is relatively easy to achieve then low cost options such as fuel switching may be sufficient. However, if emissions constraints are very tough, then it may be necessary to adopt more expensive technologies, such as small-scale renewables or carbon capture and storage.

1.35. There is also a question about the volume (rather than the price) of the renewables investment implied by delivering a high level of abatement. The electricity system has to meet several objectives simultaneously, including being able to respond to short-term fluctuations in demand. If large volume renewables are not able to deliver all of the characteristics required by the electricity system then other high volume but low carbon technologies may be required.

1.36. Nuclear plants can play a role in reducing emissions from the electricity sector. For example, in 2005, 78 TWh of electricity was generated from nuclear power stations, avoiding 28 MtCO2 (8 MtC) of emissions compared to generating that output from efficient gas-fired plant. By 2010, however, nearly 20% of the current GB nuclear capacity is scheduled to have closed. If it is not replaced, emissions from other generating plant will have to reduce by at least 2 MtC, simply to keep emissions at their current levels.

The Role of Emissions Trading

1.37. A well-functioning market in abatement can tackle some of the uncertainties discussed above and such a scheme already exists in the form of the EU ETS. If market participants are provided with the right price signals then they can make decisions about which technologies represent the best investment to deliver all of the requirements of the electricity system. This includes a diversity of fuel sources and flexibility of response as well as environmental constraints. In a market facing a binding emissions constraint we would expect the cheapest means of abatement to be exploited first, with the more expensive options gradually being used up to the point at which the emissions target is met and there is no need to pursue further abatement.

1.38. Within the EU ETS, if abatement in the UK is relatively expensive, UK firms can more cheaply comply with their obligations by buying allowances and thereby supporting lower cost abatement outside the UK. Similarly, if abatement in the UK is relatively low cost, UK firms can reduce emissions and sell allowances to participants in other countries. The allowance price will rise to the point where all the abatement required to meet the emission constraint across all participants is delivered.

1.39. The availability of a well-functioning international abatement market allows climate change targets to be met at minimum cost. In the short term participants can compare the cost of their own physical abatement options to the cost of buying allowances, the price of which reflects the lower cost abatement options that others have at their disposal. In the longer term the traded carbon price sends a signal to technology investors about what their investments may be worth in the future.

1.40. The market can also decide whether or not nuclear technology is the best technology to deliver future energy requirements. Provided investors are exposed to the full costs resulting from climate change and the full costs of the provision of nuclear plant, they should be able to reach a decision on whether new nuclear plants represent the most economic way of achieving the required emissions reductions. It will be important that external constraints such as planning and licensing difficulties, and issues such as long-term waste management, are resolved, so that these do not act to distort such investment decisions. We recognise that under the current form of EU ETS, the long term signals may not be sufficiently strong. However, this can be effectively addressed by reform of the existing scheme rather than abandoning a market-based approach. This is discussed further later in the appendix.

1.41. If such a market mechanism is not used and, instead, the Government adopts policies to support specific technologies, then there is a risk those technologies will not achieve the emission reductions at the lowest cost. In addition, it may increase the cost of achieving other objectives, such as security and diversity of supply. Supporting specific technologies reduces the scope for innovation and introduction of new technologies which may be better at delivering the requirements of the energy system. Provided appropriate long-term signals are in place, the decisions of market participants will bring forward an appropriate mix of technologies to meet environmental constraints as well as system security and diversity of supply.

1.42. Although markets are well placed to deal with uncertainties around costs and technology choices, they are not effective at dealing with political uncertainty. Therefore, establishing credible, long-term, abatement targets is an essential element in ensuring effective functioning of the market and achieving abatement targets.

Developing the EU Emissions Trading Scheme

1.43. As a cap and trade scheme, the existing EU ETS is designed to allow emission reductions to be made at least cost. The scheme is the central element of both EU and UK climate change policy. It works by placing a price on the emission of carbon dioxide which provides an incentive for producers to reduce emissions. Installations with relatively cheap abatement opportunities will reduce emissions and sell any surplus allowances or avoid buying additional allowances. Similarly, consumers have an incentive to reduce their consumption of products which result in emissions of greenhouse gases.

1.44. The scheme came into effect on 1 January 2005 and is compulsory for installations in the sectors specified in the Directive. The first phase lasts for three years and the second phase coincides with the Kyoto commitment period (2008 - 2012). Member States must submit a National Allocation Plan (NAP) to the Commission for each phase of the scheme setting out details on the allocation methodology, including the total number of allowances and the allocation to each installation, as well as details on issues such as the treatment of new entrants. The Commission has to approve the NAP for allowances to be issued to installations in that country.

1.45. Installations in the scheme must surrender allowances to match the volume of emissions in the preceding year. The allowances are tradable, which provides flexibility in terms of how the overall cap is met. Installations which do not surrender sufficient allowances to cover their emissions face a fine of €40/tCO2 in the first phase (€100/tCO2 in the second phase) and in the following year must surrender sufficient allowances to cover the shortfall. The reconciliation for emissions during 2005 is currently taking place and are due to be published in May 2006.

1.46. Although the ETS is intended to deliver lowest cost abatement, there are a number of elements of the design which may prevent this. This includes the long-term uncertainty created, which may prevent investment in long-term carbon abatement technologies. This uncertainty derives from:

- the five-year phases, with a new cap set only 18 months in advance of the start of each phase;
- the cap being set by the aggregate of the national allocation plans of 25 Member states rather than centrally;
- the scheme being relatively new and a number of the features evolving, e.g. definitions, coverage, market arrangements, relationship with Kyoto flexible mechanisms;
- the uncertain political environment, i.e. the Kyoto protocol and the lack of a successor agreement from 2013.

1.47. Other design elements which prevent the delivery of the required level of abatement at the lowest possible cost include:

- the restricted coverage of the scheme, which may prevent low cost abatement options from being exploited;
- free allocation of allowances, which creates distributional impacts; and
- new entry and closure rules, which may distort the incentives of the scheme and increase costs.

Long-term uncertainty

1.48. The short-term nature of the targets creates uncertainty that may mean expensive short-term abatement options are substituted for cheaper long-term abatement options. Long-term abatement options are likely to require substantial capital investment which may only provide sufficient return if CO2 emissions are valued over the lifetime of the investment. In the absence of long-term abatement targets, investors may be unwilling to commit the required capital as the return is too uncertain. As a result, the only abatement options which are available are short-run options such as fuel-switching or reducing production.

1.49. This is a form of regulatory failure and could be addressed by providing greater certainty on long-term targets for example, through longer phases, perhaps combined with earlier submission of NAPs so that targets were known further ahead the start of the phase would provide up to 13 years of certainty on targets compared to the current 6.5 years. Alternatively, the NAPs could include proposed caps for two or more phases. Although this would provide an indication of likely scarcity, it would not eliminate the uncertainty. Another alternative would be for a political agreement to set out the future cap for the EU as a whole with distribution of the cap among Member States left for more detailed future negotiation.

Sectoral coverage

1.50. The scheme currently covers major stationary sources of emissions but does not cover some sectors which are important in terms of emissions, including aviation and surface transport. The absence of these and other sectors means that abatement may not be occurring at the lowest possible cost across the economy as a whole. Member States are able to unilaterally opt in additional sectors and gases, subject to approval by the Commission. However, it is likely that competitiveness concerns associated with including additional sectors means that co-ordinated action would be required.

1.51. The UK government has expanded the coverage of the scheme in the UK for Phase 2 and proposals are under discussion for the inclusion of aviation in the scheme in the future. Further expansion of the scheme to cover other significant sectors would provide greater benefits to the functioning of the scheme.

Free allocation

1.52. The Directive specifies that at least 95% of allowances in the first phase and at least 90% of allowances in the second phase must be allocated free of charge.

Although it should not affect the overall efficiency of the scheme, free allocation does have distributional impacts and creates profits in some sectors, notably electricity generation.

1.53. In practice, only a small number of Member States opted to include auctioning in the first phase and only at a very low level. However, in the recently published draft NAP for phase 2, the UK government is proposing 2-10% auctioning.

1.54. We welcome the proposal to gain early experience of the use of auctioning as an allocation methodology and would urge the government to increase use of auctioning in future phases. Full auctioning of allowances would be the most efficient mechanism for allocation and would reduce the administrative burden of implementing a methodology for free allocation.

New entry and closure provisions

1.55. Finally, the existence of new entry and closure rules can further distort the incentives of the scheme. Closure of old, inefficient installations is a valid abatement option. Existing closure rules mean that operators have an incentive to keep installations open, even if they are only operating at very minimal levels, in order to retain access to a future allocation of allowances. The government has argued that this is beneficial for security of supply as it maintains generation capacity on the system. However, the existence of surplus capacity may distort electricity prices and reduce the incentive for new capacity to be brought on to the system. If the old capacity is unwilling or not actually capable of running beyond minimal levels, this may increase the risk of supply interruptions at peak times.

1.56. The existing practice in most Member States provides an allocation of free allowances to new installations which come within the boundaries of the scheme. This essentially acts as a subsidy to investment in new sources of carbon dioxide emissions and may result in over-investment in carbon intensive technologies and reduced investment in low-carbon technologies. This is exacerbated by the lack of long-term targets discussed above. Facing uncertainty about whether or not a carbon price will exist in the future, investors may opt to invest in lower cost fossil-based technologies, knowing that in the short-term they will receive a free allocation of allowances.

1.57. These issues could all be resolved with some adjustments to the design of the scheme. Some of the proposals may require changes to the Directive. The Commission's 2006 review of the Directive provides an opportunity for adapting the scheme to improve its efficiency and effectiveness. We urge the Government to make maximum use of this opportunity. Other elements could be implemented by Member States on a unilateral basis, although this may raise other issues in relation to competitiveness and consistency of the scheme across the EU.

Alternative proposals for long term carbon contracts

1.58. As discussed above, one of the greatest shortcomings of the EU ETS is that it does not deliver any long term certainty to potential investors in carbon abatement technology. There is no long term certainty as to the level of abatement required by

the EU ETS beyond 2007, the coverage of the scheme beyond 2012, or even whether there will be a scheme at all in the longer term. While the market is well placed to deal with normal economic and technological uncertainty, it is less able to deal with the impact of political uncertainty on investments. The depth of public policy commitment to achieve greenhouse gas reduction targets is the key issue here. The government could address this by committing to long-term carbon targets.

1.59. A number of proposals have been put forward to deal with the lack of certainty. However, many depend on essentially replacing the current scheme which would only further increase regulatory uncertainty. The challenge is to develop mechanisms that can exist alongside the existing ETS and not undermine it.

Carbon contracts

1.60. Proposals based on long term carbon contracts could address the issues discussed above[26]. Such contracts could provide long term price signals to support the development of large, capital intensive abatement technologies but at the same time are compatible with the EU ETS and the Kyoto framework. However, they are also viable if the EU ETS does not continue.

1.61. An objective of these policies should also be to minimise the burden and risk to taxpayers and energy consumers. The government would invite bids for proposals to reduce emissions of greenhouse gases in the period after 2012. All sectors of the economy, including major energy development consortiums, could bid with what they consider to be feasible abatement strategies. The invitation would be technologically neutral - it could include proposals for the development of nuclear power stations; renewable energy projects or sequestration projects - and contracts would be awarded to the projects with the lowest unit cost of abatement.

1.62. The government would need to choose whether to fix quantities or expenditure in advance, and decide how to finance the contracts. Helm and Hepburn propose that a target for the amount of abatement should be fixed in advance. This approach, however, leaves the government open to cost uncertainty. An alternative would be to set a particular budget, and to acquire as much abatement as might be possible within that budget.

1.63. As noted, a major advantage of carbon contracts is that they are fully compatible with the EU ETS and it may be possible to link the contracts directly into the EU allowance markets. For example, the contracted volume of abatement can be deducted from the free allocation in the EU ETS and sold into the allowance market or to other obligated parties. In this way the government can recover part or all of the expenditure involved in entering the contracts. This would serve to provide longer term stability to allowance markets and improve liquidity.

1.64. The contracts could be financed directly from government taxation revenue or could be from a specifically identified source, such as the auction of ETS allowances. If the finance is from general revenue the sunk outlay may not be fully recovered. However, financing from a new and specifically identified revenue source would mean that only as much abatement as could be financed would be purchased. It

[26] See, for example, Helm and Hepburn 2005.

would avoid the risks of the Treasury being unable to recover expenditure sunk in the contracts, so is less vulnerable to future risk of no EU ETS. It is attractive from an economic point of view because it reduces the gains to generators arising from free allocation and improves the efficiency of allocation.

Ofgem preferred model

- To secure long-term abatement, the Government would need to contract for 15 years of abatement. Beyond that, the investment would be amortised, and/or there would be sufficient market transformation that the abatement would not need further support. In other words, we assume that to achieve a sustainable annual reduction in emissions of 1 tonne, a stream of abatement covering 15 years would be needed (equivalent to 15 tonnes).

- Assuming the EU ETS continues with essentially the same structure, the Government would contract in advance of the start of a Phase 3 for a number of 15-year abatement streams of 1 tC (3.7 tCO2) to cover the period 2013-2027; and would do so again in advance of each subsequent phase.

- The contracts would be acquired through open auction, bids could be any abatement technology.

- In parallel, over the five years of phase 2 of the EU ETS (2008-2012), the Government would auction the maximum 10% of allowances. At an allowance price of €25/tCO2 and based on the UK's draft National Allocation Plan published in March 2006, this would raise around £2 billion[27].

- The revenue raised from the allowance auction would be used to purchase long term contracts. The amount of abatement acquired would depend on the contract auction price. If the auction price is similar to the current ETS allowance price, it would be possible to acquire more than 2 MtC of long term abatement. However, the additional certainty may mean that acquiring long term abatement is cheaper than short term abatement indicated by the allowance price and it may be possible to acquire a greater volume of abatement.

- In the Climate Change Program 2006, projections suggest that UK emissions of carbon dioxide will be around 140 MtC in 2010. Meeting the 2050 target suggests further reductions of 10 MtC in every subsequent 5-year phase.[28] Therefore 2 MtC of long term abatement could make a significant contribution to the required Phase 3 abatement.

[27] The analysis in this document is based on an allowance price of €25/tCO2, which was a typical price in 2005 and early 2006. Since the analysis was completed, the allowance price has dropped to around €12/tCO2. The effect of using the lower allowance price in the analysis would be to reduce the estimate of the revenue that could be raised through an auction and reduce the estimate of the value of allowances allocated to the generation sector over the first two phases. The rapid change in allowance price in late April 2006 demonstrates the volatility in the market and the inherent uncertainty in predicting allowance prices for the rest of Phase 1 and in later phases of the scheme. However, the price may be less volatile as the market matures and allowance prices may be higher in future phases as targets become more stringent. If the cost of short-term abatement falls, then the cost of long-term abatement may also be expected to fall so there may little impact on the volume of abatement that can be contracted.

[28] Note that this does not take into account any additional abatement that may be required to economic growth or rising demand for energy services.

- If free allocation remains in Phase 3 of the EU ETS, the free allocation could be reduced annually by the quantity of long term abatement. This volume of allowances would then be auctioned. This would create an ongoing income stream to fund future abatement contracts.

- If future climate change policies change significantly from the current model of Kyoto-style targets implemented through international trading, the government will hold enforceable contracts for future streams of abatement that could be effectively banked against whatever the alternative arrangements may be, and at the same time the Government is not exposed to future cashflow risks.

Appendix 4 - EU energy policy & interactions with UK energy policy

Introduction

1.1. European energy markets and EU regulatory and legislative policies have an ever-increasing influence on energy markets and consumers in Britain. For example:

- wholesale gas and electricity prices are affected by those in neighbouring markets which may not be as liberalised as those in Britain;
- the commercial and physical links between British and European gas markets will be strengthened significantly by plans for major new gas pipelines and Liquid Natural Gas (LNG) import terminals;
- the England-France electricity interconnector plays a significant role in the electricity market, especially at peak times. New interconnectors have also been proposed, for instance between Wales and Ireland; and
- as Britain becomes an importer of gas, we will increasingly rely on access to continental gas pipelines to transport gas to our market.

1.2. Although there is a commitment to liberalise European energy markets, progress so far has been slow. The impact of this is felt by UK consumers. It is crucial therefore that the UK Government continues to place pressure on other Member States to open up their markets and ensure that the European Commission takes the necessary steps to achieve the goal of a single, competitive European energy market. Such a competitive market will lead to more competitive prices, provide a stable framework for investment, and allow sustainability objectives to be met in the most efficient manner.

1.3. Ofgem has a leading role in pressing for the liberalisation of European electricity and gas markets. We hold the Chair of the European Group of Electricity and Gas Regulators (ERGEG), which advises the European Commission on liberalisation issues.

Key issues that need to be resolved

1.4. Although improvements are being made, for example there is now an energy regulator in all member states and access conditions to networks are improving, there are a number of key issues that need to be resolved if further progress is to be made towards achieving a single, competitive EU energy market. These include:

- securing full implementation of existing liberalisation legislation;
- diminishing the market power of incumbent companies;
- integrating the development and operation of the gas and electricity networks so that they operate effectively as a 'European grid' to serve the needs of all European customers, not just national ones;
- providing regulators with the requisite powers, resources and independence to regulate their energy markets effectively;

- significantly improving transparency to allow markets are to work efficiently and effectively;
- facilitating greater market integration;
- improving non-discriminatory access to networks and other essential facilities such as gas storage and LNG;
- establishing an appropriate framework for efficient investment in essential infrastructure, particularly for cross-border investments (including transit), where there is a 'regulatory gap', and infrastructure to bring gas to the EU from non-EU producing countries; and
- establishing effective unbundling arrangements for network operators to ensure that they have the right commercial incentives to underpin the development of a competitive market.

1.5. Resolving a number of these issues may require new European legislation.

1.6. It is also crucial that competition authorities take strong action where there is evidence of market abuse.

1.7. It is also important that sustainability objectives can be delivered.

1.8. A number of important initiatives are relevant here as outlined below.

Green paper on EU Energy Policy

1.9. The Commission has recently published a Green Paper which identified competitive prices, security of supply and sustainable energy use as the three key pillars of energy policy. Ofgem agrees with this broad analysis, although we would note that these will only be delivered by a liberalised and competitive EU energy market. The key issues that need to be resolved in achieving this are outlined above. We urge the Government to push other Member States and the European Commission to bring about the necessary changes (including legislation) to overcome these issues.

1.10. It is important therefore that the review of the UK's energy policy, where appropriate, takes account of these issues. The UK has led the way in liberalising its energy market, and it is crucial that it continues to do so - by ensuring that all of the building blocks are in place for a competitive and efficient energy market. Key issues that may impact on UK energy policy are:

- integrating effectively gas and electricity networks; and
- developing an appropriate framework for investment (filling the regulatory gap), particularly for cross-border investments.

1.11. The Green Paper also highlights other important issues which may be relevant to the UK's energy policy:

- **diversification of the energy mix** - The Green Paper has proposed an EU-wide debate on energy sources to ensure that overall the EU's energy mix pursues the objectives of security of supply, competitiveness and sustainable development. Ofgem welcomes such a debate although it is clear that member states should

continue to determine their own energy mix. It is important however that intervention at the EU and national level should not distort the market. This could undermine the operation of the market and impact on security of supply;

- **solidarity** - The Green Paper proposes a review of existing EU legislation on oil and gas stocks; enhanced transparency on security of energy supply; improved networks security through increased co-operation between network operators and possibly a formal grouping of European network operators; as well as greater physical security of infrastructure, possibly through common standards. We believe that the main focus of a European approach should be to help markets to deliver security of supply and as such, good information/transparency should be welcomed. However the focus of the Green Paper is on more interventionist measures both at an EU and national level. It will be important for the UK Government to consider carefully the impact of any steps taken in this area, particularly the impact on the operation of the market including the investment decisions that are taken by stakeholders;
- **sustainability of the EU ETS and future development** - The Green Paper identifies the EU ETS as a flexible and cost-efficient framework for more climate-friendly energy production. Ofgem supports the use of such broad market-based instruments as a way to work towards environmental objectives at least cost to consumers and in a way that is compatible with liberalised markets and considers that it is appropriate that the Green Paper gives priority to such measures. Ofgem also supports the view of the Green Paper that the Commission's review of the Emissions Trading Directive provides an opportunity for expanding and further improving the functioning of the scheme in Phase 3 and beyond. This may allow improvements such as coverage of more sectors, a longer term framework and greater use of auctioning as the most efficient way to allocate allowances. The Green Paper proposes a goal of saving 20% on energy use by 2030 through a series of measures, including financial instruments and agreeing a series of concrete measures to meet this objective, including a 'white certificates' trading system, minimum performance standards, and initiatives to bring clean and renewable energy sources closer to markets. Where programmes are established to achieve such objectives they should be subject to rigorous cost-benefit analysis and should be implemented in a way that is compatible with the developing liberalised markets in gas and electricity;
- **innovation and technology** - The Green Paper proposes an appropriately funded strategic energy technology plan to be developed. We consider that it is important that publicly funded support for research and development is additional to, rather than a replacement for, R&D carried out (and paid for) by energy companies. Any support given should be technology neutral to avoid inappropriate or inefficient investment in a particular area; and
- **external policy** - The Green Paper has proposed creating a clearly defined external energy policy to cover a number of initiatives. Many of these are outside Ofgem's remit although we do believe that improved political relations with supplier countries must be helpful in terms of security of supply and the operation of the market. The specific proposals put forward by the Commission will need to be considered carefully by the UK Government as it develops its Energy Policy.

DG Competition Sector Inquiries

1.12. DG Competition recently published a preliminary report on its sectoral inquiry of electricity and gas, which identifies a number of key problems in the functioning of the EU gas and electricity market:

- transparency;
- market integration;
- vertical foreclosure;
- market concentration; and
- price formation.

1.13. Ofgem strongly supports the findings of the preliminary report. It is important now that the Commission brings forward remedies both through the application of competition law and also identifying specific regulatory/legislative changes. We welcome the Commission's announcement that it intends to launch competition cases against companies where there is evidence of market abuse. It is important that the UK Government continues to support the Commission in any competition cases that the Commission undertakes to improve the way that the EU energy market operates.

DG Transport and Energy initiatives to ensure compliance with existing Directives

1.14. DG Transport and Energy has recently launched infraction proceedings against a number of EU Member States for failure to implement the existing package of legislation. The significant number of actions merely serves to highlight the lack of progress in many Member States towards liberalising their markets. The European Commission is showing that it is prepared to tackle economic protectionism in action as well as words. Ofgem welcomes this move. Consumers across Europe should be able to reap the rewards of liberalisation. British customers in particular have paid dearly for the lack of competition in continental Europe. A lack of transparency coupled with low flows through the interconnector has added around £1 billion to UK wholesale gas prices this winter.

Energy Services Directive

1.15. The Directive on energy end-use efficiency and energy services covers the household, transport, commercial, small industry and agriculture sectors which are not covered by the EU ETS. The Directive is aimed at removing market barriers and imperfections for end use energy efficiency. It also aims to set up a market for energy services. The key areas are:

- the scale of the target: Member States shall adopt an indicative energy saving target of 9% over 9 years;
- the placing of obligations on energy suppliers to offer and promote energy services, energy audits or other energy efficiency improvement measures;
- energy suppliers should provide actual time of use meters where technically feasible and cost effective and provide informative billing;

- it is not clear that the suppliers are the best people to provide energy efficiency services to the non-domestic market. This requires specialist knowledge that the suppliers do not have; it would be better to tie in with one of the Carbon Trust's programmes; and
- in relation to metering, Ofgem published a consultation paper on innovative metering in electricity and gas in February. We have been keeping the other Government departments informed of our progress.

Work of the European Regulators

1.16. European regulators, through both the Council of European Energy Regulators and the ERGEG, are undertaking work to help foster the development of a competitive EU energy market. In addition to detailed work on market rules and operation (for example transparency issues and gas storage, transparency and gas and electricity balancing), ERGEG has recently launched two Regional Initiatives[29], one on gas and another on electricity, with the aim of pushing forward market integration at a practical level through a number of regional projects co-ordinated by regulators in the region. A similar regional initiative will also be launched in gas around the end of April 2005. These Regional Initiatives involve all stakeholders including network operators, network users, consumers, traders, Member States and the Commission. The intention is that each Regional Energy Market project within the Regional Initiative will identify the key issues that are preventing the development of more integrated operational regional markets. They will identify priority areas for action, and develop a plan and timetable for taking things forward including identifying responsibility for action. Political support for the regional initiative is crucial as some of the steps that will need to be taken may require legislative or regulatory changes in due course. The UK is part of a regional electricity market project which includes Ireland and France. In gas the UK will be part of a regional market project which includes Ireland, Belgium, France and the Netherlands.

[29] The electricity regional initiative is made up of seven regional market projects. The gas regional initiative will be made up of four regional market projects.

Appendix 5 – Tackling Fuel Poverty

Ofgem's Role in Fuel Poverty

1.1. Ofgem's principal objective is to protect the interests of consumers, wherever appropriate by promoting effective competition. Ofgem also has a statutory duty to have regard to the interests of customers who are disabled, chronically sick, of pensionable age, on low incomes or living in rural areas. There is statutory guidance from Government on social and environmental issues to which the Authority must have regard when discharging its functions and which requires us, within the sphere of our responsibility, to help achieve the Government's fuel poverty targets. Any measures with significant financial implications for customers or industry will, however, be implemented by Government.

1.2. Over the years, Ofgem's broad approach of promoting competitive energy markets and regulating network monopolies has helped keep price increases to a minimum. It has given customers opportunities to make savings on their bills by switching suppliers, changing payment method or taking up energy efficiency measures.

1.3. To meet our social obligations in tackling fuel poverty, Ofgem has adopted both formal and informal routes, combining the benefits of competitive markets with more specific measures. That approach will continue. Measures taken under the Social Action Strategy will be designed, as far as possible, to avoid any inhibition or distortion of competition.

1.4. Ofgem has a duty to have regard to the principles of better regulation and has sought to take forward initiatives through a self-regulatory approach where appropriate.

Government Targets

1.5. It is the goal of the Government and the Devolved Administrations to seek an end to the problem of fuel poverty. In England, the target is to seek an end to fuel poverty for vulnerable households by 2010, with a target that by 2016 no person will still be in fuel poverty. In Scotland, the overall objective is to ensure an end to fuel poverty by 2016. In Wales the target date is 2018.

Table 1.1: Progress against the targets (millions)

	UK 2003	UK 2006*	England 2003	England 2006	Scotland 2003/4	Scotland 2006*
Fuel Poor	2.0	3.0	1.2	n/a	0.3	0.5
Vulnerable	1.5	n./a	1.0	2.0		

* Estimates by energywatch.

Suppliers' Contribution

1.6. A review of suppliers' corporate social initiatives, published by Ofgem in June 2005 estimated that a limited number of initiatives, such as tariff schemes and Energy Efficiency Commitment (EEC) programmes, are assisting significant numbers of vulnerable customers. Suppliers incurred opportunity costs of approximately £110 million in aggregate during 2004/5 on social initiatives in addition to approximately £160 million required expenditure under EEC. Even after mainstream tariff initiatives were excluded, five of the six suppliers assisted the equivalent of just over 20% of their vulnerable customers. Ofgem believes the contribution of corporate social initiatives has increased substantially since 2004/5. Some sort of social tariff has been offered to around 0.5 million customers, under various supplier schemes this winter.

Resources Required (England)

1.7. The Fuel Poverty Advisory Group (FPAG) in England has estimated, in its Fourth Annual Report (March 2006), that the following resources are required for the 2010 target:

- Gas areas, plus insulation in non-gas areas - £ 1.5 bn;
- Non gas areas - £ 2.4 bn; and
- Total - £ 3.9 bn.

1.8. This is an increase of 25% to 30% in resources compared with current programmes of £3.05bn, comprising Warm Front, EEC Priority Group, and Decent Homes expenditure. FPAG estimates that 40% of fuel poor households are in non-gas areas, with average costs of £4000 per household required.

Table 1.2: Excess winter mortality

	England	Scotland	Wales	Total
1998-1999	44,010	4,750	2,900	51,660
1999-2000	45,650	5,190	2,970	53,810
2000-2001	23,400	2,220	1,700	27,320
2001-2002	25,800	1,840	1,500	29,140
2002-2003	22,700	2,510	1,400	26,610

1.9. Comparison can be made between Great Britain and other affluent countries of northern Europe. Whilst it is generally agreed that factors affecting excess winter mortality are varied and complex there is a strong relationship between thermal standards in housing and excess winter deaths.

Table 1.3: Excess winter mortality as % increase over non-winter deaths[30]

Austria	14%
Belgium	13%
Denmark	12%
Finland	10%
France	13%
Germany	11%
Ireland	21%
Netherlands	11%
England	19%
Scotland	16%
Wales	17%
Mean	16%

[30] Source: National Energy Action

Appendix 6 - Glossary

A

AGR (Advanced Gas-cooled Reactor)

These are the second generation of British gas-cooled nuclear reactors, using graphite as the neutron moderator and carbon dioxide as coolant.

B

BETTA (British Electricity Trading and Transmission Arrangements)

Implemented on 1 April 2005, the BETTA programme extended the electricity trading arrangements in England and Wales to Scotland, putting in place an open and competitive British electricity market.

Billion Cubic Metres (bcm)

A unit of measure for gas supply. Annual UK demand for gas is currently around 110bcm.

C

Capital Expenditure (Capex)

Expenditure on investment in long-lived transmission assets such as gas pipelines or electricity overhead lines.

Cartel

A combination of independent business organisations formed to regulate production, pricing and marketing of goods by the members.

CEGB

Central Electricity Generating Board, the cornerstone of the British electricity industry for almost 50 years from nationalisation in 1947 to privatisation in the 1990s.

Combined Cycle Gas Turbine (CCGT)

Uses both gas and steam turbine cycles in a single plant to produce electricity with high conversion efficiencies and low emissions.

D

Distribution Price Control Review (DPCR)

The price control review for the electricity distribution network operators conducted in 2003 and 2004. The resulting price control covers the years 2005 to 2010.

E

Emissions Trading Scheme (ETS)

An administrative approach used to reduce the cost of pollution control by providing economic incentives for achieving reductions in the emissions of pollutants.

F

Flue Gas Desulphurisation

A technology that employs a sorbent, usually lime or limestone, to remove sulphur dioxide from the gases produced by burning fossil fuels. Flue gas desulphurisation is current state-of-the art technology for major SO2 emitters, like power plants.

FPAG (Fuel Poverty Advisory Group)

The Fuel Poverty Advisory Group is an advisory non-departmental public body sponsored by Defra/DTI. Its primary task is to report on the progress of delivery of the Government's Fuel Poverty Strategy and to propose and implement improvements to regional or local mechanisms for its delivery.

G

GB Queue

A queue of generation connection applications waiting to be processed.

GBSO (GB System Operator)

The system operator has responsibility to construct, maintain and operate the NTS and associated equipment in an economic, efficient and co-ordinated manner. The SO is responsible for ensuring the day-to-day operation of the transmission system.

GWh (Giga watt hours)

A unit of measure for electricity – annual production of electricity in GB is around 360,000GWh.

I

Interconnector

A pipeline transporting gas to another country. The Irish interconnector transports gas across the Irish Sea to both the Republic of Ireland and Northern Ireland. The Continental Interconnector, between the UK and Belgium, is capable of flowing gas in either direction.

L

Liquefied Natural Gas (LNG)

LNG is natural gas that has been condensed into a liquid at atmospheric pressure by cooling it to approximately -163 degrees Celsius. LNG is transported by specially designed vessels and stored in specially designed tanks. LNG is about 1/600th the volume of natural gas, making it much more cost-efficient to transport over long distances where pipelines do not exist.

Liquidity

Liquidity refers to the ability to buy or sell quickly a particular item without causing a significant movement in the price. The essential characteristic of a liquid market is that there are ready and willing buyers and sellers at all times.

M

Microgeneration

Generation of low-carbon heat and power by individuals, for example solar panels and wind turbines.

Million Cubic Metres (mcm)

A unit of measure for gas volumes.

Minimum Reserve Requirements

An amount of gas required to be held in storage in case of emergency.

Monopoly

Exclusive control by one group of the means of producing or selling a commodity or service.

Mothballed plant

The temporary closure of unit(s) within a power station, with the possibility that the unit(s) would be returned to services should it become economical to do so.

N

National Grid Gas (NGG)

The licensed gas transporter responsible for the gas transmission system and for four of the regional gas distribution companies.

National Transmission System (NTS)

The high pressure gas transmission system used to transport gas around the country.

New Electricity Trading Arrangements (NETA)

The arrangements defining the electricity wholesale market, comprising trading between generators and suppliers of electricity in England and Wales.

O

Open Cycle Gas Turbines (OCGT)

The most basic type of gas turbine, where the working gas (normally air) does not circulate through the system but is released to the environment for cooling.

Operational Expenditure (Opex)

Expenditure incurred by a business in the process of normal daily operations.

P

Pressurised Water Reactor (PWR)

A type of nuclear power reactor that uses ordinary light water for both coolant and for neutron moderation.

R

Renewable Energy

An energy resource that is replaced rapidly by natural processes. Examples include solar, geothermal, wind and biomass energy. Fossil fuels such as oil, gas and coal are non-renewable energy resources.

Renewable Obligation Certificate (ROC)

A transferable certificate received by eligible renewable generators for each MWh of electricity generated. ROCs are traded separately from power and are used by power suppliers to fulfil their Renewables Obligations under the Utilities Act 2000.

RPI-X

The form of price control currently applied to network monopolies. Each company is given a revenue allowance in the first year of each control period. The price control then specifies that in each subsequent year the allowance will move by 'X' per cent, in real terms.

S

Smart Metering

Advanced gas and electricity metering technology that offers customers more information about, and control over, their energy use (such as providing information on total energy consumption in terms of value, not only volume), or allows for automated and remote measurement.

Social Tariffs

Special payment arrangement, over and above those specified by a supplier's licence conditions, devised with a view to benefiting disadvantaged energy consumers.

Security and Quality of Supply Standard (SQSS)

The standard in accordance with which the electricity transmission licensees shall plan, develop and operate the transmission system.

Strategic Stocks

The stock of fuels of essential importance for the continuation of the production process, built up in order to compensate for long hold-ups of production or imports.

Supplier

A party that is a net seller of natural gas or power to the UK market.

T

Terminal

A point in the National Transmission System where gas enters or exits the UK gas network.

Third Party Access

An arrangement giving parties other than the owners of fixed infrastructure assets, such as pipelines, transmission lines and gas storage, the right to purchase capacity in and to use these facilities.

Transmission Investment for Renewable Generation (TIRG)

Measures introduced by Ofgem to support investment in transmission capacity for renewable generation.

Transmission Price Control Review (TPCR)

Periodic review of the price controls of electricity and gas transmission licensees, the objective of which is to allow the network licensees to collect revenues consistent with the efficient operation of the network.

Turbine

Device that converts the flow of a fluid (air, steam, water, or hot gases) into mechanical motion for generating electricity.

U

UKCS (United Kingdom Continental Shelf)

The UKCS comprises those areas of the sea bed over which the UK exercises sovereign rights of exploration and exploitation of natural resources, primarily gas and oil.

V

Vertical Foreclosure

A feature of vertical integration where the upstream division of the integrated firm makes a specialised input for its sister downstream division, although it would, as an independent firm, have provided a generalised input.

W

Warm Front

Warm Front is the Government's main grant-funded programme for tackling fuel poverty. The scheme was launched in June 2000 and before its name changed to Warm Front, it was called the Home Energy Efficiency Scheme.