



dti

**MEETING THE
ENERGY CHALLENGE**

A White Paper on Energy

MAY 2007



Meeting the Energy Challenge
A White Paper on Energy
May 2007
Department of Trade and Industry

Presented to Parliament by the Secretary of State for Trade and Industry
By Command of Her Majesty

May 2007

© Crown Copyright 2007

The text in this document (excluding the Royal Arms and departmental logos) may be reproduced free of charge in any format or medium providing that it is reproduced accurately and not used in a misleading context.

The material must be acknowledged as Crown copyright and the title of the document specified.

Any enquiries relating to the copyright in this document should be addressed to The Licensing Division, HMSO, St Clements House, 2-16 Colegate, Norwich, NR3 1BQ.

Fax: 01603 723000 or e-mail: licensing@cabinet-office.x.gsi.gov.uk



Contents

Foreword by the Rt Hon. Alistair Darling MP	4
Executive Summary	6
Chapter 1: Energy and climate security: a global challenge	28
Chapter 2: Saving energy	48
• Section 2.1 Fuel Poverty	76
Chapter 3: Heat and Distributed Generation	83
Chapter 4: Oil, Gas and Coal	105
Chapter 5: Electricity Generation	
• Section 5.1 Investment Framework	125
• Section 5.2 Networks	138
• Section 5.3 Renewables	143
• Section 5.4 Cleaner Coal and Carbon Capture and Storage for Fossil Fuels	170
• Section 5.5 Nuclear Power	180
Chapter 6: Research and Development, Demonstration and Deployment, and Skills	216
Chapter 7: Transport	235
Chapter 8: Planning	253
Chapter 9: Devolved Administrations, English Regions and Local Authorities	275
Chapter 10: Impact of our Measures	281
Chapter 11: Implementation	296
Annexes	
Annex A: Fourth Annual report on progress towards the 2003 Energy White Paper goals	306
Annex B: Summary of updated energy and carbon emissions projections	328
Annex C: UK Position on the EU Emissions Trading Scheme	334
Annex D: Consultations	338

Foreword by the Rt Hon. Alistair Darling MP



The Energy Review last year spelt out the big challenges we face: the need to work with other countries to tackle climate change by cutting greenhouse gas emissions, and the need to ensure we have secure energy supplies. Both are vital for our future prosperity. Both are global issues that call for international and UK action.

The evidence supporting urgent action on climate change continues to mount. Sir Nicholas Stern's report last autumn underlined the importance of acting now and in concert with other countries.

Meanwhile, world energy demand continues to grow and is likely to be met largely by fossil fuels for some time to come. This means rising greenhouse gas emissions and greater competition for energy resources.

The UK's reserves of oil and gas are declining. While significant amounts still remain in the North Sea, production has hit its peak and is now falling. We will make the most of the reserves we have, but as our economy grows, we will become increasingly dependent on imports in a world where supplies are concentrated in less stable regions.

Energy companies are also going to be making large investments in the coming years to update and replace ageing power stations and other infrastructure. We need to create the right conditions for this investment, so we get timely and increasingly low carbon electricity supplies.

This White Paper sets out a framework for action to address these challenges and help us manage these risks.

It sets out our international strategy which recognises that we need to tackle climate change and energy security together. Influenced by the UK, Europe has made a good start. The European Council agreed earlier this year to a new strategy, including commitments to competitive markets and cuts in greenhouse gas emissions, and a central role for the EU Emissions Trading Scheme as the potential basis for a global carbon market.



We shall need to influence the wider international community in the same direction, notably in getting consensus on the post 2012 Kyoto Framework for reducing greenhouse gas emissions.

The White Paper also sets out the measures we are taking here at home. Our measures will help us all become more energy efficient, showing consumers how they can cut their energy use, making big organisations like supermarkets limit their emissions and setting tougher standards for the homes we build and the products we buy.

We also want to mobilise the enthusiasm and potential of individuals and communities to generate their own energy locally, through solar panels and wind turbines for example. We are therefore bringing forward a range of measures to support more distributed forms of energy.

But we shall still need large scale energy investments. Our aim will be to ensure that companies have a wide range of low carbon options available so we can retain a diverse energy mix, which is good for our security of supply, and will help us to become a low carbon economy. This is why we are strengthening our support for renewable electricity and will be launching a competition for the demonstration of carbon capture and storage - which has the potential to reduce carbon dioxide emissions from fossil fuel power stations by as much as 90%. We are also proposing reforms to our planning system, so that applications are handled in a more efficient way, both for developers and the public.

Alongside this White Paper, we are publishing a consultation document on nuclear power so that we can take a decision before the end of the year on whether it is in the public interest for companies to have this option available when making their investment decisions.

The Government's measures, including those in this White Paper, put us on track by 2020 to cut carbon emissions by more than a quarter compared to 1990 levels, as well as making significant cuts in gas consumption.

We are determined to become a low carbon economy. But further measures will be needed if we are to achieve our long-term goals and in the light of further international agreements, in Europe and more widely. This White Paper sets out a framework for action to enable us to make real progress now toward tackling climate change and ensuring secure and affordable energy supplies.

Executive Summary

Energy is essential in almost every aspect of our lives and for the success of our economy. We face two long-term energy challenges:

- tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

As we set out in *The Energy Challenge* published in 2006, the context in which we are seeking to meet these challenges is evolving, in particular:

- the growing evidence of the impact of climate change and wider international recognition that there needs to be a concerted global effort to cut greenhouse gas emissions, especially carbon dioxide;
- rising fossil fuel prices and slower than expected liberalisation of EU energy markets at a time when the UK is increasingly relying on imported energy;
- heightened awareness of the risks arising from the concentration of the world's remaining oil and gas reserves in fewer regions around the world, namely the Middle East and North Africa, and Russia and Central Asia;
- in the UK, companies will need to make substantial new investment in power stations, the electricity grid, and gas infrastructure.

This White Paper sets out the Government's international and domestic energy strategy to respond to these changing circumstances, address the long-term energy challenges we face and deliver our four energy policy goals¹. It sets out how we are implementing the measures in the Energy Review Report in 2006, as well as those announced since, including in the Pre-Budget Report in 2006 and the Budget in 2007.

¹ Our four energy policy goals are:

- to put ourselves on a path to cutting the UK's carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- to ensure that every home is adequately and affordably heated.



The challenges

Climate change, as a result of rising greenhouse gas emissions, threatens the stability of the world's climate, economy and population. More than two thirds of the world's carbon dioxide emissions come from the way we produce and use energy, so energy policy has to play a major part in meeting this challenge.

The causes and consequences of climate change are global, and while national governments can and should take action, the ultimate solution must be collective global effort. On current trends, global emissions are set to reach double pre-industrial levels before 2050, with severe impacts on our climate and the global economy. A key conclusion from the Stern Review² was that in the long-term the cost of inaction would be far higher than the cost of tackling climate change now. It also makes clear that the costs are lowest if nations act together.

At the same time energy demand worldwide continues to increase, particularly in the United States and emerging economies, such as China and India. On the basis of present policies, global energy demand will be more than 50% higher in 2030 than today, with energy related greenhouse gas emissions around 55% higher³.

Even if we realise more potential for increasing low carbon sources of energy, it is clear that coal, oil and gas will play a significant part in meeting the world's energy needs for the foreseeable future, and we need to find ways to reduce their emissions. Also, with the UK increasingly reliant on imported energy, we need to manage the risks arising from the concentration of fossil fuel reserves in fewer and further away places, some of them in less stable parts of the world.

Increased competition for resources will see international trade in fossil fuels double by 2030. This trend and factors such as abuse of market power, poor energy market information, infrastructure security risks, and regulatory uncertainty (particularly concerning government actions to tackle climate change) could add to the risks to energy security and prices.

The International Energy Agency (IEA) forecasts that \$20 trillion of investment will be needed to meet these challenges by 2030. The investment decisions that will be taken over the next two decades will be critical in determining the world's climate and the security of its energy supplies. At home it is likely that the UK will need around 30-35GW of new electricity generation capacity over the next two decades and around two thirds of this capacity by 2020. This is because many of our coal and most of our existing nuclear power stations are set to close. And energy demand will grow over time, despite increased energy efficiency, as the economy expands.

² http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

³ World Energy Outlook, IEA, 2006. See <http://www.worldenergyoutlook.org/>

Our strategy

To deliver energy security and accelerate the transition to a low carbon economy requires urgent and ambitious action at home and abroad.

We need to:

- save energy;
- develop cleaner energy supplies; and
- secure reliable energy supplies at prices set in competitive markets.

Our strategy continues to be based on the principle that independently regulated, competitive energy markets, are the most cost-effective and efficient way of delivering our objectives.

The Energy Review Report identified a number of areas where the policy and regulatory framework governing energy markets needs to be strengthened. This White Paper sets out our response, involving increased international cooperation as well as action at home. The key elements of our strategy are:

- **Establish an international framework to tackle climate change**
This should include a shared vision for stabilising the concentration of greenhouse gases in the atmosphere. We also want a strengthened EU Emissions Trading Scheme (EU ETS) to deliver a market price for carbon and to be the basis for a global carbon market. This will enable carbon emissions to be reduced in the most cost-effective way.
- **Provide legally binding carbon targets for the whole UK economy, progressively reducing emissions**
The draft Climate Change Bill creates a new legal framework for the UK achieving, through domestic and international action, at least a 60% reduction in carbon dioxide emissions by 2050, and a 26-32% reduction by 2020, against a 1990 baseline. The Government will be required to set five-year carbon budgets, placing binding limits on aggregate carbon dioxide emissions. There is provision in the draft Bill for the targets to be amended in light of significant developments in climate science or in international law or policy.
- **Make further progress in achieving fully competitive and transparent international markets**
This will enable companies to get fair access to the energy resources we need. Effective markets will ensure that the world's finite resources are used in the most efficient way and ensure that we make the transition to a low carbon economy at least cost. Further liberalisation of EU energy markets is an important part of this.
- **Encourage more energy saving through better information, incentives and regulation**
By removing barriers to the take up of cost-effective energy efficiency measures, all of us, business, individuals and the public sector, can take steps to reduce emissions and our energy dependence. We are also working in the EU and G8 to promote energy efficiency internationally.
- **Provide more support for low carbon technologies**
We need to bring about a step change in global investment to bring forward low carbon technologies. The private sector on its own may not



invest adequately in research, development, demonstration and deployment of these technologies. This White Paper describes how public / private sector collaboration and increased international collaboration can address this problem.

- **Ensure the right conditions for investment**

We need a clear and stable regulatory regime, including for valuing carbon, to reduce uncertainty for business and help to ensure sufficient, timely investment. We also need to improve our planning system and to provide better information and analysis of long-term energy market trends to inform energy purchasing and investment decisions.

Many of these elements have an important international dimension. And in this White Paper, we are bringing them together for the first time in an integrated international energy strategy which describes the action we are taking to help deliver secure energy supplies and tackle climate change.

Our improved framework will help businesses, individuals and the Government deliver more energy saving, cleaner energy supplies and timely energy investments.

Saving energy

The starting point for our energy policy is to save energy. It is often the cheapest way of reducing carbon emissions, certainly in the short-term. It can also contribute to security of supply, for example by reducing our need for energy imports, and reduce fuel poverty through lower bills.

We need action here in the UK and internationally. Many of our energy using products, like cars and domestic appliances, are traded internationally, so to be fully effective we need international agreements on higher standards of energy efficiency. We will therefore press for higher EU and international standards to improve vehicles' fuel efficiency and increase the energy efficiency of products, including by reducing levels of stand-by power. We support the Commission's proposals to save 20% of the EU's energy consumption through improved energy efficiency by 2020. And we are working with our G8 partners to deliver commitments to promote international cooperation on product labelling and standards.

At home, we will take action to build on the growing interest among businesses and individuals in playing a direct part in tackling climate change by saving energy.

Saving energy: business

Energy intensive businesses already face incentives to save energy and reduce emissions, for example through Climate Change Agreements, and through the EU ETS. Large non-energy intensive public and private sector organisations in the UK such as hotel chains, supermarkets, banks, central Government and large Local Authorities account for around 10% of the UK's emissions. Emissions trading could deliver significant energy savings in this sector. We have therefore decided to introduce a mandatory cap and trade

scheme, a Carbon Reduction Commitment, which will apply to the largest organisations in this sector; those whose mandatory half hourly metered electricity consumption is greater than 6,000MWh per year. Such companies generate the large majority of emissions from this sector. The Government will shortly consult on how it can best be implemented.

To ensure all businesses have the necessary information on the energy consumption of their buildings, we shall require all business premises to have an Energy Performance Certificate, when they are built, sold or rented out. These certificates describe a buildings energy ratings and set out what steps can be taken to improve their performance, saving energy and reducing energy bills.

We shall also consult on a requirement for energy suppliers to extend, to all business users in Great Britain, advanced and smart metering services, within the next 5 years. This will not apply to the smallest business users, nor to larger businesses with half hourly meters.

Saving energy: households

We want new homes to be zero carbon as soon as practically possible. We are consulting on making this mandatory from 2016, and we will announce a decision later this year.

We will also continue to improve the energy efficiency of existing homes. The average household could avoid emissions of around 0.5 tonnes of carbon a year, save energy and lower energy bills by becoming more energy efficient⁴. Our programmes have already reached half the UK's homes. We are making the appliances within our homes more energy efficient. For example, we are working with retailers and manufacturers to phase out energy inefficient light bulbs by around 2011, and we are publishing with this White Paper proposals for higher standards in consumer electronics.

We will continue to ensure that energy suppliers work with householders to save energy and carbon emissions. We launch alongside this White Paper our statutory consultation on a Carbon Emission Reduction Target (CERT) for 2008-2011. This is the new name for the Energy Efficiency Commitment and reflects the new scheme's focus on reducing carbon emissions. The consultation proposes that energy suppliers double their current effort. Longer term, from 2012, we want to develop this scheme to support a transformation in the way suppliers view their relationship with the end consumer, helping their customers save energy, by shifting their focus to the provision of energy services, rather than simply selling units of energy.

We will empower consumers to make more informed energy choices by requiring the provision of clearer information on bills and more advice about energy efficiency. We will launch an on-line CO₂ calculator which will enable households to know how their everyday activities contribute to emissions. We are also undertaking trials of smart meters and real time displays which enable people to track their energy use conveniently in their homes. Subject to the results of these trials we intend to work with energy companies to roll



these out to households over the next 10 years. In the meantime, real time displays will be provided with any new meters fitted from 2008. Because it will take a number of years before a new meter and display can be rolled out to every household, we have decided that between 2008-2010, real time displays, will be available free of charge to any household that requests one.

We will also introduce Energy Performance Certificates for new and existing homes. Anyone selling, leasing or renting their property will need to provide a Certificate setting out the energy performance of the building.

To maximise the impact of the Certificates we will better co-ordinate advice and support to householders on energy efficiency and microgeneration.

The Government's intention is that, by the end of the next decade, all householders will have been offered help to introduce energy efficiency measures, with the aim that, where practically possible, all homes will have achieved their cost-effective energy efficiency potential.

Saving energy: transport

The UK is leading the way in Europe to bring about a tough new set of mandatory standards for the fuel efficiency of new cars. We welcome the Commission's recent Communication⁵ and in particular their intention to introduce mandatory targets for new car fuel efficiency. The EU needs a long-term strategy for improving vehicle fuel efficiency including an objective beyond 2012 that average new car emissions should reduce to 100 grams of carbon dioxide per kilometre. We will continue to work closely with the Commission and other interested parties as the proposals are developed.

The achievement of these new standards is likely to be challenging.

To support progress towards them and to achieve carbon savings in other modes of transport we will be working with the industry to implement a Low Carbon Transport Innovation Strategy, which is being launched alongside this White Paper. This will provide the framework and resources to help bring cleaner, more fuel efficient vehicles to market and stimulate innovation.

We have also been pushing in Europe for inclusion of aviation in the EU ETS, and we support the Commission's proposals to do this. We are also urging serious consideration of the inclusion of surface transport in the Scheme which has the potential to deliver further carbon savings.

Transport is an area where choices and the behaviour of individuals could make a large impact. In March 2007, the Government launched a climate change communications campaign to raise awareness amongst drivers of what they can do to help reduce emissions. Tax measures can also play a part and we are encouraging cleaner fuels through favourable Company Car Tax and Vehicle Excise Duty for smaller, more fuel efficient vehicles. We will continue to examine how fiscal and other policy instruments can achieve our aims.

⁵ http://ec.europa.eu/environment/co2/pdf/com_2007_19_en.pdf

Saving energy: public sector

The Government must also play an important part. By 2012, we will have made the central Government office estate carbon neutral. We will bring forward plans for funding of energy efficient new social housing and public sector buildings, and energy efficient procurement of new public sector cars and energy using products:

- large public sector organisations will be required to reduce emissions by participating in the Carbon Reduction Commitment scheme;
- we are making it a condition of Government funding that all new social housing built by registered social landlords and other developers and all new homes developed by English Partnerships comply with level 3 of the Code for Sustainable Homes;
- buildings greater than 1,000m² occupied by public authorities and by institutions providing publicly funded services to large numbers of people will be required to display a Certificate showing the energy rating of the building and the steps that can be taken to improve its energy performance; and
- from 2008, we will set challenging energy efficiency standards for all new products and services that the Government procures.

Clean energy supplies

While saving energy is often the most cost effective way to reduce emissions, if we are to meet our goals, we also need to move towards cleaner energy supplies of heat, electricity and transport fuels.

Heat and distributed energy

More than two thirds of the UK's heat comes from gas that is fed through the nationwide gas grid. Gas can be converted to useful heat at over 90% efficiency in modern condensing boilers. This centralised system has kept down costs through economies of scale and allowed us to provide secure, cost-effective delivery of gas directly to many of our homes and businesses. The largest and most cost-effective carbon saving in this sector in the short to medium-term will therefore come through improved energy efficiency, supported by the energy saving measures in this White Paper.

The long-term possibilities for large scale alternatives to gas for the production of heat may be through the production and use of hydrogen and low carbon electricity. However, development of hydrogen as a heating source would require costly new infrastructure to manufacture and distribute the hydrogen. Similarly, a switch to low carbon electricity for heating would require existing heating systems in homes and buildings to be replaced.

In the short and medium-term, a combination of new and existing technologies are opening up new possibilities for carbon reduction by producing and using heat and electricity at a local level; that is, distributed or decentralised energy. This includes microgeneration, district heating schemes, combined heat and power and biomass fuelled heating at community and industry scale. Biomass heating is already cost competitive with fossil fuels for some purposes. Alongside this White Paper, the Government is publishing its *Biomass Strategy*, which aims to expand the supply and use of energy from this renewable fuel source in a sustainable way.



We are also publishing the results of the joint Ofgem-DTI review of distributed electricity generation promised in the Energy Review Report. Based on the work of that review, we are taking forward a number of proposals and measures that will assist more widespread deployment of distributed electricity and heat generation in the UK including:

- more flexible market and licensing arrangements for distributed, low carbon electricity supply, to be implemented by the end of 2008;
- greater clarity on the terms offered by energy suppliers to reward microgenerators for the excess electricity they produce and want to export back to the grid;
- provision of information and advice to those individuals, communities and developers considering distributed energy solutions, alongside advice on energy saving; and
- incentivising Distributed Network Operators to ensure more efficient and speedy connection to networks.

These measures will reinforce other steps we are already taking to boost distributed energy, including:

- implementation of the Microgeneration Strategy, *Our Energy Challenge: Power from the people* published in March 2006, with planning permission for microgeneration becoming easier from autumn this year and financial support to build the market for microgeneration;
- measures to encourage deployment of combined heat and power (CHP), including: exemption from the Climate Change Levy; improved treatment under Phase II of the EU ETS; and better planning guidance to ensure that the CHP option is considered;
- our commitment to require all new homes to be zero carbon, from a date to be fixed following consultation. Using low carbon distributed energy technologies will be a key way for developers to meet this requirement.

Taken together, these measures will help to ensure that decentralised energy can continue to grow alongside the centralised system⁶. We shall also carry out further work on the options available for reducing the carbon impact of heat and its use and we shall take into account the implementation of the European Council agreement to a binding renewable energy target for 2020 (see 'EU energy policy' paragraphs later in this summary). However, the current higher costs and low level of penetration of many of these technologies will mean that, even with substantial growth, they will not keep pace with the need for new electricity generation capacity, as existing coal and nuclear power stations close.

Cleaner large scale electricity generation

We have a diverse mix of power stations: coal and gas account for over one third each; nuclear about a fifth; and renewables around 4%. This diversity helps avoid over-dependence on a single fuel type, contributing to security of supply.

Companies will need to make substantial new investments over the next 20 years, as many of our nuclear and coal power stations close. These investment

⁶ Alongside these measures, we have also established a Foresight Project that will help inform our understanding of any long term issues arising from the parallel development of the centralised and decentralised systems. This is due to report in summer 2008.

decisions will affect our generation mix. In setting the market framework in which these decisions are taken, the Government needs to ensure that, over time, we also move towards a low carbon mix.

A key part of this framework is the EU ETS which, by establishing a carbon price, ensures companies investing in new power stations take account of the cost of carbon. This provides incentives for investment in low carbon electricity generation. In this White Paper, we set out steps to build a more effective EU ETS. We also set out steps designed to increase the options available for investment in low carbon technologies, for example renewables and carbon capture and storage. We are also launching a consultation on whether it would be in the public interest for new nuclear power stations to be an option available to companies making investments in new generation capacity.

Renewable electricity

Renewables are key to our strategy to tackle climate change and deploy cleaner sources of energy. We have a target that aims to see renewables grow as a proportion of our electricity supplies to 10% by 2010, with an aspiration for this level to double by 2020. The Renewables Obligation (RO) is the main mechanism for incentivising this growth. This White Paper confirms our intention to strengthen the RO, increasing the Obligation to up to 20% as and when increasing amounts of renewables are deployed. We have also decided to retain the link between the Retail Price Index (RPI) and the RO buy-out price from 2015/16.

We shall introduce banding of the RO to offer differentiated levels of support to different renewable technologies. This will encourage the increased development and deployment of a broader set of renewable technologies. Alongside this White Paper, we are launching a consultation document on the specific bands we propose to introduce and our other proposals to strengthen and modify the RO. Our intention is that the new bands will come into force in 2009⁷. Based on our projections our proposals to strengthen and modify the RO will see electricity supplies from renewable sources tripling between now and 2015 to around 15% of the total electricity supplied. The RO and the Climate Change Levy exemption is projected to provide around £1billion of annual support for deployment of renewable electricity in 2010, rising to around £2billion of annual support in 2020. A strengthened EU ETS should also support investment in renewables.

In addition to creating the right financial framework, we need to lower important practical barriers to renewables investment:

- large scale renewables projects will benefit immediately from the improved planning inquiry rules that we introduced from the beginning of April 2007;
- longer term, as set out in the planning White Paper 2007, *Planning for Sustainable Future* published in May 2007, we shall implement fundamental reform of the planning system which will bring benefits to all large scale energy infrastructure, including large scale offshore and onshore renewable electricity project; and
- we shall act jointly with Ofgem and National Grid to remove key barriers to connecting renewables projects to the transmission grid.



Looking ahead, we shall need to take into account the implementation of the European Council agreement to a binding renewable energy target for 2020 (see 'EU energy policy' paragraphs later in this summary).

Fossil fuel electricity generation and carbon capture and storage

The need to reduce carbon emissions whilst ensuring secure energy supplies means that we cannot rely on renewables alone. This is because we need a diverse electricity generation mix. Moreover, some of the most cost-effective renewable technologies, such as wind, are intermittent and cannot produce electricity on demand.

We will continue to need fossil fuels as part of a diverse energy mix for some time to come. But in order to meet our carbon reduction goals, sources such as coal and gas must become cleaner. And it is in our own vital interests that the technologies necessary to mitigate the emissions from burning fossil fuels are developed and deployed as rapidly as possible – especially as fossil fuel use by emerging economies, such as China and India, is growing rapidly as their economies expand. Carbon capture and storage (CCS) is an emerging combination of technologies which could reduce emissions from fossil fuel power stations by as much as 90%.

CCS with electricity generation has not yet been proven on a commercial basis, although some key elements of the process have been demonstrated. So the next step is commercial scale demonstration. In the Budget in 2007 the Government therefore announced that it would launch a competition to demonstrate commercial scale CCS on power generation in the UK. The Government intends to launch the competition in November 2007, with the aim of having the demonstration operating early in the next decade. When operational, this will make the UK a world leader in this globally important technology. Successful demonstration of CCS would be a major contribution by the UK to global efforts to tackle climate change.

The Government has also set up a taskforce to examine the regulatory framework to ensure that it facilitates CCS, with a consultation on the options for regulation of the full chain of CCS technologies to be launched later this year.

Nuclear power

Nuclear power currently accounts for approximately 18% of our electricity generation and 7.5% of total UK energy supplies. It is a low carbon source of electricity and makes an important contribution to the diversity of our energy supplies. Without our existing nuclear power stations, our carbon emissions would have been 5 to 12% higher in 2004 than otherwise⁸. However, most of the existing stations are due to close in the next 15 years or so, based on published lifetimes.

The Government left open the question of nuclear power in 2003⁹ and said that before any decision to build new nuclear power stations, there would need to be the fullest public consultation and proposals in a further White Paper. Since then, we have:

⁸ Sustainable Development Commission, *The Role of Nuclear Power in a Low Carbon Economy, Paper 2: Reducing CO₂ emissions – Nuclear and the Alternatives*, March 2006

⁹ Energy White Paper, *Our Energy Future – creating a low carbon economy*, HMG Cm 5761

- seen increasing evidence of climate change and wider international recognition of the need for global action;
- made significant progress in tackling the legacy waste issue;
- observed significant changes in the economics of nuclear power relative to other electricity generation technologies. This has been driven by two main factors: greater than expected increases in fossil fuel prices; and the introduction of a market price for carbon which requires investors to take account of the cost of carbon emissions in their investment decisions. Both of these factors have increased the relative costs of fossil fuel electricity generation; and
- seen some energy companies expressing a strong interest in investing in new nuclear power stations.

We are also now closer to the point where significant amounts of our existing generation capacity, including nuclear power stations, will need to be replaced.

In considering whether it is in the public interest to allow private sector companies to invest in new nuclear power stations, we need to take account of the wide range of uncertainties that make it difficult to predict the future need for and use of energy. For example, it is difficult to predict how fossil fuel, raw materials and carbon prices will change in the future, all of which will affect the relative economics of different electricity generation technologies. We do not know with certainty at what speed different renewable technologies will develop. We cannot yet be sure that it will be technically feasible or economic to apply carbon capture and storage technology safely to electricity generation on a commercial scale. And we do not know how demand for energy might vary over the next 40-50 years. Moreover, we cannot know what the international political landscape might look like by 2050, although we do know that oil and gas supplies are increasingly concentrated in countries which are in less stable parts of the world.

Given the long timeframes involved, this uncertainty is inevitable. We believe a market-based approach within a clear policy framework provides an effective way to help us manage this uncertainty and deliver our energy policy goals. This is because companies are best placed to weigh up and manage the complex range of interrelated factors affecting the economics of energy investments.

The private sector will be best able to help us deliver our goals and manage the associated risks when they have access to a wide range of low carbon investment options. The Government's role is therefore to provide a policy framework that encourages the development of a wide range of low carbon technologies, so we can minimise the costs and risks to the economy of achieving our goals.

We have modelled a number of different future scenarios as part of the analysis to support this White Paper. The modelling indicates that it might be possible under certain assumptions to reduce the UK's carbon emissions by 60% by 2050 without new nuclear power stations. However, if we were to plan on this basis, we would be in danger of not meeting our policy goals:



- **security of supply:** we would be reliant on a more limited number of technologies to achieve our goals, some of which (e.g. carbon capture and storage) are yet to be proven at a commercial scale with power generation. This would expose the UK to greater security of supply risks, because our electricity supplies would probably be less diverse as a result of excluding nuclear; and
- **reducing carbon emissions:** by removing one of the currently more cost-effective low carbon options, we would increase the risk of failing to meet our long-term carbon reduction goal.

There would also be a risk of higher costs to the UK economy: by excluding nuclear as an option, our modelling indicates that meeting our carbon emissions reduction goal would be more expensive.

We recognise that, as with all generation technologies, there are advantages and disadvantages with new nuclear power. But having reviewed the evidence and information available we believe that the advantages outweigh the disadvantages and that the disadvantages can be effectively managed.

On this basis, the Government's preliminary view is that it is in the public interest to give the private sector the option of investing in new nuclear power stations. This view is subject to the consultation we are launching on this issue alongside this White Paper. However, if the Government confirms this preliminary view, it would be for the private sector to fund, develop, and build new nuclear power stations in the UK, including meeting the full costs of decommissioning and their full share of waste management costs.

Section 5.5 of this document, contains the executive summary of the nuclear consultation document¹⁰ published alongside this White Paper.

The consultation document sets out evidence and information on a range of issues, and respondents are invited to form their own view based on this information. In considering this consultation, respondents will be able to take into account the information brought forward as part of the forthcoming consultation on geological disposal as part of the Managing Radioactive Waste Safety programme.

Alongside the nuclear consultation, the Government is proceeding, on a contingent basis, with a range of facilitative actions to reduce regulatory and planning risks to prepare for the possibility that the Government concludes that it is in public interest to allow private sector companies the option of investing in new nuclear power stations. Details are set out in the consultation document.

Low carbon transport

The main opportunity for carbon reductions from transport in the near-term lies in reducing energy use, through a combination of increasing the fuel efficiency of vehicles and through the choices we make in using them and other transport modes; and in the longer term in innovation in vehicle design and through spatial and transport planning. Similarly, we are determined to make more progress in using cleaner fuels in the near-term and to explore opportunities for suitable alternative fuels in the longer-term.

10 <http://www.dti.gov.uk/energy/whitepaper/consultations/nuclearpower2007>

The Government will introduce the Renewable Transport Fuel Obligation (RTFO) in 2008-09. It will require suppliers of transport fuel to ensure that a proportion of the fuel we use in our vehicles comes from renewable sources. By 2010-11 this proportion will rise to 5%, resulting in carbon emission reductions – equivalent to taking a million cars off our roads. The Government intends to go beyond this 5% level once important cost, standards and especially sustainability concerns can be addressed.

Renewable energy: bringing the elements together

The Government's policies, including proposals in this White Paper, will help increase the proportion of energy the UK sources from renewables.

We do this; notably:

- in electricity generation, by strengthening and modifying the Renewables Obligation, by reforming the planning system and by removing barriers to the growth of decentralised electricity generation;
- in heat, by publishing a Biomass Strategy which identifies opportunities for increasing the use of renewables in energy production and by announcing further work to develop a more strategic approach to heat; and
- in transport, by requiring through the RTFO that an increasing proportion of our transport fuel should come from renewable sources.

Looking ahead, we shall also need to take into account the implementation of the European Council agreement to a binding renewable energy target for 2020 (see 'EU energy policy' paragraphs later in this summary).

Research, development and demonstration of new low carbon technologies

The Stern Review notes that policy to support innovation and the deployment of low carbon technologies is a key means of mitigating climate change. New technologies for producing and using energy in electricity generation, heating and transport offer the potential to reduce carbon emissions in the future more cost-effectively.

We will shortly be launching the Energy Technologies Institute. This is a joint venture between the public and private sectors with a minimum budget of around £600 million over ten years devoted to the research and development of emerging low carbon technologies, including for transport. It will provide the UK with a world-class means for delivering energy technology research. Our ambition is that it will become part of a global network connecting the best scientists and engineers working in these fields. In addition, the Environmental Transformation Fund will open in 2008. This will bring together Government's support for demonstration and deployment of low carbon energy and energy efficiency technologies with support for energy and environment-related international development.

The Government is also publishing alongside this White Paper a Low Carbon Transport Innovation Strategy which sets out our approach to stimulating innovation in low carbon transport technologies. The Strategy reflects the important role that new technology will play in delivering long-term carbon emissions reductions in the transport sector, and provides a framework for accelerated technology development across the whole innovation system. It provides substantial new funds for research, development and demonstration



projects, to bring forward the greatest value for UK industry as well as environmental gain.

Security of supply

The UK faces two main security of supply challenges:

- our increasing reliance on imports of oil and gas in a world where energy demand is rising and energy is becoming more politicised; and,
- our requirement for substantial, and timely, private sector investment over the next two decades in gas infrastructure, power stations; and electricity networks.

We need to manage the potential risks associated with higher imports of fossil fuels. These include:

- increased competition for energy resources in the face of growing global energy demand;
- reserves becoming increasingly concentrated in fewer, further away places;
- the need to purchase supplies from markets which are neither transparent nor truly competitive; and
- the possibility that there will be insufficient investment in key producer countries in new oil and gas production.

We will also need to see significant private sector investment in infrastructure to bring the energy we need from overseas to the UK. For example, our current projections of gas demand imply that we will need to increase our gas import capacity by 15-30% by 2020. Much of the investment we need to achieve this is already in train.

In electricity markets we will need investment in new generation capacity of around 30-35 GW over the next two decades to replace power station retirements and meet rising electricity demand as the economy grows. The timeliness of this new investment will be key to ensuring security of electricity supplies.

Many of the measures to tackle climate change set out in this White Paper will also bring benefits to the UK's security of energy supplies. For example, our efforts to save energy in business, households and the public sector will reduce the need for energy imports by reducing overall demand. Similarly, saving energy will reduce the level of new investment we need in large scale electricity generation; as will an increase in renewables and decentralised energy, including microgeneration. Finally, by increasing the number of low carbon generation investment options available to the private sector, we will increase the diversity of our energy supplies, reducing electricity security of supply risks.

In addition, to meet our security of supply challenges, we will:

- maximise the economic production of our domestic energy sources which, together with our energy saving measures, will help reduce our dependence on energy imports;
- work for more effective and transparent international energy markets so that our companies can get fair access to the energy resources we need; and
- strengthen the UK energy investment framework so that investors have

the confidence to make timely investments in new gas and electricity infrastructure consistent with our energy goals.

Maximising economic production from our domestic fossil fuel reserves

Fossil fuels will continue to play an essential role in our energy system for the foreseeable future. We must therefore maximise the economic recovery of the UK's remaining reserves of oil and gas by boosting investment in the North Sea and ensuring it remains competitive as it matures. We are working with the industry on the basis for establishing new infrastructure to the West of Shetland to enable additional oil and gas to be exploited. We are also putting in place measures to remove barriers to commercial deal making, particularly for smaller firms, such as improving the speed and simplicity of the North Sea licensing process. The Government has emphasised the importance it attaches to an appropriate and stable fiscal regime for the UK Continental Shelf.

Coal continues to play an important role in our energy mix. In autumn 2006, we established the Coal Forum. This brings together the key players from the coal industry and the power sector to develop strategies to maximise economic production of UK coal. The Coal Forum has confirmed the importance of a continuing role for coal as part of a diverse and resilient energy mix and identified a number of potential benefits from use of UK produced coal. Making the best use of UK energy resources, including coal reserves, where it is economically viable and environmentally acceptable to do so contributes to our security of supply goals. The Government believes that these factors reflect a value in maintaining access to economically recoverable reserves of coal.

Effective and transparent international energy markets

Greater exploitation of our own domestic resources will only slow the rate of growth of the fossil fuel imports we need to meet our energy needs – imports are certain to increase. Companies need confidence in the international markets in which they buy fuel. An open European market is an essential part of this, allowing companies to source adequate and competitively priced supplies of energy from abroad, particularly gas. We therefore welcome the strong action the Commission is taking to enforce the 2003 EU internal market legislation, and support the proposals set out in the Commission's 2007 Strategic Energy Review and endorsed at the Spring European Council 2007. We will also press for greater transparency beyond the EU through our work bilaterally and through international organisations such as the International Energy Agency.

Improving the UK's energy investment framework

We must ensure we have the right domestic investment framework so that companies make sufficient, timely investments:

- in infrastructure to transport energy from overseas markets to the UK and then on to the final consumer; and
- in new power stations, as existing stations close.



Timely, credible information is key to the effective functioning of energy markets and to support timely investment decisions, whether in gas import and storage infrastructure or new electricity power stations. We will therefore publish from this autumn better information and analysis on future energy supply and demand trends to help inform energy suppliers and consumers with their investment and purchasing decisions and help inform the development of Government policy.

Another key barrier to timely investment is the effectiveness of the planning system. The Planning White Paper 2007, *Planning for a Sustainable Future*¹¹, sets out radical changes to the planning system which will enable us to take decisions on key national infrastructure in a way that is timely, efficient and predictable, and which will improve the accountability of the system, the transparency of decisions, and the ability of the public and communities to participate effectively in them.

We will legislate as soon as Parliamentary time allows with the aim of introducing this reformed system in 2009 comprising three key elements:

- a strategic context where Ministers set a clear national case for important energy infrastructure;
- a streamlined and efficient decision making process which allows all aspects of a major project to be considered together and decisions to be taken by an independent body; and
- a strong commitment to effective public consultation, including when Ministers prepare National Policy Statements on the case for new infrastructure and through a new obligation on developers to consult before they submit their applications.

Improved market information and reforms to the planning system will help all energy infrastructure investment. In addition, this White Paper sets out measures to strengthen and clarify the investment framework which are specific to the gas market and to the electricity market.

Improving gas security of supply

Our policies to save energy, encourage a diverse low carbon electricity mix and maximise economic recovery of gas from the UKCS will all help gas security of supply by reducing our need for gas imports. In addition, the following changes, alongside the reforms in the Planning White Paper *Planning for a Sustainable Future*, will help to reduce regulatory uncertainty for companies investing in gas infrastructure, helping to improve gas security of supply:

- we propose to rationalise the different offshore gas development consent regimes and create, as far as possible, a unified, single consent regime with a harmonised set of requirements and procedures;
- we will introduce a new offshore licensing system which will facilitate the development of offshore gas storage and unloading of Liquefied Natural Gas; and
- over the last six months, we have prepared new guidance to assist those considering investing in gas storage projects and associated infrastructure under the existing planning system.

¹¹ <http://www.communities.gov.uk/index.asp?id=1143104>

Improving electricity security of supply

Our strategy will address the risks to security of electricity supply and the need for substantial new investment in power stations and networks in the following ways:

- by encouraging the development of low carbon electricity generation technologies and a market framework that encourages companies to invest in them, thereby helping to ensure a more diverse and secure electricity mix for the future. Specific measures include:
 - reinforcing our commitment to building a more effective EU ETS to provide companies with confidence in there being a price for carbon over the long-term. While we are confident that our efforts to strengthen the EU ETS will be successful and that the draft Climate Change Bill demonstrates our long-term commitment to carbon reductions, we will keep open the option of further measures to reinforce the operation of the scheme in the UK should this be necessary to provide greater certainty to investors;
 - strengthening our policy on the Renewables Obligation, announcing plans for demonstration of carbon capture and storage on a commercial scale, and resolving, subject to the consultation we are publishing alongside this White Paper, whether it is in the public interest for new nuclear power stations to be an investment option for companies investing in the UK; and
 - the proposed publication of a new Planning Policy Statement on Climate Change which will require planners and local authorities to recognise the national need for renewable and low carbon electricity generation.
- in April 2007, we introduced new secondary legislation to update the inquiry rules for large scale electricity generation projects and associated infrastructure that should streamline the consenting process. We have prepared new guidance to assist those considering investing in electricity generation projects, combined heat and power projects and associated infrastructure; and
- the recent Ofgem transmission price control and last year's price control on distribution networks will allow for substantial new investment to replace ageing infrastructure and connect new generating capacity.

EU energy policy

Since the Energy Review Report in 2006, the European Council agreed in March 2007 to a common European strategy for energy security and tackling climate change. This includes further steps to complete the internal market in gas and electricity, and endorsement of the objective to save 20% of the EU's energy consumption in 2020 compared with current projections. The agreement commits the EU to a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action. The agreement assigns the EU Emissions Trading Scheme the central role in the EU's long-term strategy for reducing greenhouse gas emissions.

The European Council agreement also recognises the potential importance of carbon capture and storage and sets a target for 20% of the EU's energy to be from renewables by 2020. The target covers the energy we use in heat and transport as well as electricity. The Council also agreed a 10% binding minimum target, to be achieved by all Member States, for the share of biofuels in EU petrol and diesel consumption; this is subject to conditions, including that the production of biofuels is sustainable.



The 20% renewables target is an ambitious goal representing a large increase in Member States' renewables capacity. It will need to be taken forward in the context of the overall EU greenhouse gas target. Latest data shows that the current share of renewables in the UK's total energy mix is around 2% and for the EU as a whole around 6%¹². Projections indicate that by 2020, on the basis of existing policies, renewables would contribute around 5% of the UK's consumption and are unlikely to exceed 10% of the EU's.¹³

The Commission has been asked to bring forward detailed proposals – including for each Member State's contribution to the EU targets on greenhouse gases and renewables – by the end of this year. The Commission will need to take account of individual national circumstances and discuss and agree their proposals with Member States and the European Parliament during 2008/09. In developing proposals for the renewables target, the Commission will need, as agreed by the European Council, to give due regard to a fair and adequate allocation, taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix.

All this means there is uncertainty as to the size and nature of the UK's contribution to the EU greenhouse gas and renewables targets. To inform the decision we will need to analyse the full implications of the proposed UK contributions including: technical feasibility, cost effectiveness, our existing and potential capacity for deployment of low carbon technologies including renewables, our overall energy mix and the wider implications for energy policy including energy security and reliability.

We are already in discussion with European counterparts on these issues. In parallel we are conducting detailed analysis to explore how the targets agreed at the EU Spring Council can be implemented in the most effective way. We shall be engaging actively with interested parties, including energy producers and users, in taking this work forward.

After a decision has been reached on each Member State's contribution to the EU agreement, we will bring forward the appropriate measures, beyond those set out in this White Paper, to make our contribution to meeting these targets, and in particular to increase the share of renewable electricity, heat and transport in our mix by 2020. In the meantime, the measures and market framework set out in this White Paper allow us to make significant progress on this important agenda.

Fuel poverty

Our policies to ensure sustainable and reliable supplies of energy through competitive markets benefit all UK consumers. However, we also need to consider the social implications of our policy. Our goal remains to ensure that every home is adequately and affordably heated.

¹² The UK figure is from the *Digest of the United Kingdom Energy Statistics (DUKES)*, 2006. The European figures come from Eurostat. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL

¹³ The UK figure is based on DTI projections – for more detail see *UK Energy and CO₂ Emissions Projections*, May 2007 <http://www.dti.gov.uk/energy/whitepaper>. The European figures come from the EU Commission Renewable Energy Road Map. *Renewable energies in the 21st century: building a more sustainable future*, COM(2006)848 final.

A range of policies have been put in place to help achieve this, including the Warm Front programme (and its equivalents in the Devolved Administrations) and the Winter Fuel Payment. The Government has also introduced a number of measures to help low income households including the Pensions Credit and Working and Child Tax Credits.

The number of households in fuel poverty is still significantly lower than 1996: falling from around 6.5 million households in 1996 to less than 4 million, despite the price increases of recent years which have reversed some of the progress we have made. However, we expect long-term global energy prices to remain higher than previously. In order to meet our continued commitment to the most vulnerable in society, further action is therefore necessary.

We will better target existing assistance to ensure those who are entitled to support receive it, for example, by enabling the sharing of benefit data between organisations responsible for tackling fuel poverty. We will also be changing Warm Front to offer more benefit entitlement checks. We will be working with energy companies to encourage all companies to put in place an effective programme of assistance for vulnerable customers. Together with the measures stimulated by the funding announced in the 2006 Pre-Budget Report, we expect our new initiatives to take around 200,000 households in the UK out of fuel poverty.

However, it is clear that we shall need to do more if we are to meet our goals for eliminating fuel poverty. We are examining our fuel poverty policies, looking at the ways in which they might be improved. Next steps will be set out in the UK Fuel Poverty Strategy Fifth Annual Progress report in summer 2007.

The impact and cost of our proposals

The proposals in this White Paper constitute a comprehensive, ambitious and well integrated package which will help us make further progress towards our energy policy goals.

Impact on our energy goals

We estimate that the measures outlined in this White Paper will deliver annual savings of between 23 and 33 million tonnes of carbon (MtC) in 2020. If our measures achieve the upper end of the range of savings, we shall be on track to achieve by 2020 real progress towards our 2050 goal, as set out in the 2003 Energy White Paper. It would also put us just within the 2020 target range of a 26-32% reduction in carbon emissions on 1990 levels set out in the draft Climate Change Bill.

There are additional proposals under consideration which could deliver further carbon savings e.g. surface transport in the EU ETS, the roll-out of smart meters. In addition, we are consulting on whether it is in the public interest to allow companies to invest in new nuclear power stations. Any additional measures required to achieve the UK's contribution to the EU's Spring Council agreement could further reduce UK carbon emissions.



Our package of policies will also improve the reliability of our energy supplies by: maintaining a diverse energy mix; supporting and stimulating the growth in indigenous energy supplies; incentivising the efficient use of fossil fuels; and strengthening the market framework to deliver sufficient and timely investment. As a result of our measures, electricity consumption could be up to 15% lower in 2020 and gas consumption up to 13% lower than it would otherwise have been, thereby reducing our need for gas imports. Overall, we estimate that our measures will improve the energy efficiency of the UK economy by around 10% by 2020. This would be over and above the 25% improvement we already expect over that period.

Some existing policies to tackle climate change, including the EU ETS and the Renewables Obligation are contributing to higher energy prices. We have analysed the impact of our new measures on retail energy prices. On the basis of this analysis, we estimate the overall impact of our package of measures, (excluding EU ETS) as contributing an additional 4% to electricity prices and 3% to gas prices by 2020. Many of our measures are targeted at improving energy efficiency; such measures will have little impact on energy bills, and in some cases will help reduce energy bills as consumers act to realise their potential savings.

We face challenges in meeting our fuel poverty targets, in part because of higher energy prices. Better targeting of existing support along with measures announced in the Pre-Budget Report in 2006 will however reduce the number of households in fuel poverty by around 200,000.

Impact on the economy

The Stern Review concluded that the benefits of strong, early co-ordinated action against climate change far outweigh the economic costs of doing nothing. It estimated that the cost of not taking action could be equivalent to losing between 5 and 20% of annual global GDP whereas the costs of taking action can be limited to around 1% of annual global GDP, if the world pursues the optimum policies.

For this White Paper, building on Stern's modelling on a global scale, we have conducted economic modelling of the impacts on the UK economy of tackling climate change. The analysis indicates that the costs of achieving a 60% reduction in domestic carbon emissions could be between a 0.3% and 1.5% reduction in the UK's GDP in 2050¹⁴. However, because it is more difficult for the economy to adjust over the short to medium term, our modelling shows that the cost of achieving a reduction in domestic emissions of 30% by 2020 could be higher, resulting in GDP being around 1.3% to 2% lower in 2020 than it otherwise would have been depending on the level of fossil fuel prices. Even if the cost were 2% of GDP in 2020, we would still see the economy grow by 40% between now and 2020.

This should not be taken as analysis of the effects of the Energy White Paper policies, but rather an estimate of the macroeconomic costs of achieving our carbon goals. The measures in this White Paper are intended to harness the

¹⁴ All of the costs presented in this section represent the change in GDP in one year rather than a cumulative impact or an impact on the GDP growth rate. In the case of the 2050 figures, the costs are compared to a scenario in which there is no carbon constraint on the economy. In the case of the 2020 numbers, the costs are compared to a scenario where no carbon price is applied to the economy.

most cost-effective ways of making carbon savings. Moreover, the modelling results presented here are based on domestic action. UK costs would be lower in the context of multilateral action and if there is scope for the UK to invest in more cost-effective abatement opportunities abroad, such as through the EU ETS, as provided for in the draft Climate Change Bill. Therefore, we believe that they will deliver significant carbon savings by 2020 at a lower cost than the 1.3-2% range.

Delivery

Meeting the challenges of energy security and climate change will require strong international co-operation as a priority, both in taking forward the EU energy strategy and more widely. At home, it will require action by the Government, business and individuals. It is the Government's role to create the right conditions and incentives so that everyone can play their part. Success will require not only the right conditions for the large scale investment we need but also the skills and experience in our workforce to deliver that investment and ensure that our vital infrastructure is effectively and safely run. We are asking the Sector Skills Councils to report on skills gaps in the energy sector and action being taken to address them.

Some of the measures in this White Paper do not require legislation and will be taken forward over the coming months. Some will require further consultation. Other measures will require legislative changes: it is our intention to bring forward those proposals as soon as Parliamentary time allows. Plans for this will be closely co-ordinated with those for the Climate Change Bill.

We will further develop our policies in the light of the implementation of the EU's strategic energy policy, in particular the legislation on further liberalisation of the EU energy markets, on Phase III of the EU Emissions Trading Scheme and on the implementation of the EU greenhouse gas and renewable energy targets.

We will take forward the proposals and further work set out in this White Paper, in accordance with the principles of better regulation. In keeping with our better regulation agenda we are undertaking a review to be completed in autumn 2007 of major climate change instruments looking to ensure there are no unnecessary duplications, inconsistencies or conflicts between existing regulatory regimes and suggest how these can be resolved in order to ensure that the regulatory burden on business is kept to a minimum.

Some matters which relate to energy policy in Scotland, Wales and Northern Ireland are the responsibility of the Devolved Administrations, and therefore, decisions on those matters are made in the light of each administration's particular circumstances. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals in this White Paper which touch on devolved matters will be progressed in accordance with the principles set out in the Memorandum of Understanding. It is expected that the Devolved



Administrations will want to consider in due course how to take forward their responsibilities that are relevant to energy policy. The Department of Enterprise, Trade and Investment in Northern Ireland has already indicated that it is committed to achieving the UK's energy goals and developing initiatives in tandem with the UK Government.

Energy and climate security: a global challenge

1.1 The United Kingdom has a challenge in common with every other nation of the world. Energy is essential for economic growth, and although the link between growth and energy use has become weaker the world's demand for energy is increasing rapidly, leading to greater competition for finite natural resources. Energy that comes from fossil fuels produces greenhouse gases which if not mitigated, threaten the stability of the world's climate (see Box 1.1). We will need to tackle that challenge as our own natural resources decline, and we become more dependent on imported fuels. We need therefore, to establish a strategy which delivers both energy and climate security. It is not sustainable to achieve one without the other. The investment decisions taken over the next two decades, will be critical in determining the world's energy and climate security and, therefore, its economic future.

1.2 This chapter sets out:

- The global nature of the energy security and climate challenges;
- how global trends will affect the UK; and
- the UK's integrated international strategy to mitigate climate and energy security risks.

BOX 1.1 RISING GLOBAL ENERGY DEMAND WILL INCREASE CARBON EMISSIONS

The International Energy Agency's "business as usual" analysis takes into account policies already enacted or adopted by Governments up to mid-2006*. It forecasts that between 2004 and 2030:

- global primary energy demand will rise by 53%, leading to a 55% increase in global carbon dioxide emissions related to energy;
- fossil fuels will remain the dominant source of energy worldwide, meeting 83% of the increase in energy demand;
- emissions from power generation will account for 44% of global energy-related emissions by 2030, as demand for electricity rises;
- coal will provide the largest incremental source of power generation, with the majority of this increase likely to be in China (55%);
- over 70% of the increase in global primary energy demand will come from developing countries, reflecting rapid economic and population growth; and
- some \$20 trillion of investment will be needed throughout the energy supply chain.

The challenge facing the world is to meet rising energy demand, to support economic growth while moving towards a low carbon economy.

* IEA, World Energy Outlook, 2006



The impacts of climate change and the case for action

1.3 The role of human activity in changing the climate is now clearer than ever and there is strong evidence of the need to take urgent action to combat climate change¹¹.

1.4 Atmospheric concentrations of carbon dioxide are at their highest for at least 650,000 years¹². The current stock of greenhouse gases in the atmosphere is equivalent to around 430 parts per million (ppm) of carbon dioxide¹³, compared with only 280 ppm before the industrial revolution. Increased concentrations have already caused the world to warm by 0.74°C in the last century and will lead to at least a further half degree of warming over the next few decades, regardless of what we now do to reduce emissions.

1.5 If annual global emissions were to remain at today's levels, the stock of greenhouse gases in the atmosphere would reach double pre-industrial levels by 2050: at around 550 ppm. At this level, there is a high probability of a global average temperature rise exceeding 2°C. In reality, however, global emissions are set to accelerate from today's levels, as demand for energy rises.

1.6 In its World Energy Outlook 2006, the International Energy Agency (IEA) considers what would happen if countries were to adopt all policies currently considered to address energy security and energy-related climate change. Even in this scenario, global emissions related to energy are still projected to rise by 31% by 2030.

1.7 The Stern Review of the Economics of Climate Change¹⁴ highlights the economic costs of failing to act to tackle climate change:

"With 5-6°C warming – which is a real possibility for the next century – existing models that include the risk of abrupt and large-scale climate change estimate an average 5-10% loss in global GDP, with poor countries suffering costs in excess of 10% of GDP"

1.8 Moreover, Stern estimates that the dangers of unabated climate change could be equivalent to at least 5% of GDP each year and could possibly rise to 20% of GDP or more if a wider range of risks and impacts are taken into account.

1.9 The costs of mitigating climate change, though significant, are substantially lower and are manageable for the world's economy. The annual cost of stabilising greenhouse gases in the atmosphere at between 450 and 550 ppm of carbon dioxide equivalent is estimated to be around 1% of GDP in 2050¹⁵.

11 Conclusions of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

12 *The Stern Review of the Economics of Climate Change, 2006.*

See http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

13 Greenhouse gas emissions can be measured in terms of their estimated global warming potential on an equivalent basis to those from carbon dioxide

14 *The Stern Review of the Economics of Climate Change, 2006*

15 *The Stern Review of the Economics of Climate Change, 2006*

1.10 Even to achieve stabilisation at 550ppm, Stern's analysis suggests that, global greenhouse gas emissions need to peak in the next 10-20 years. Stern points out that new investment over the next 10-20 years will have a profound effect on the climate in the second half of this century and the next. Failing to take the right action now and over the coming decades risks major disruption to economic and social activity, which would be very difficult to reserve.

1.11 Climate change is not simply an environmental problem, but a threat to international peace, security and development. It has far-reaching implications for the global economy and our prosperity. The most recent report of the Intergovernmental Panel on Climate Change (IPCC)¹⁶ predicts that climate change will bring severe consequences, including rising temperatures and higher sea-levels, as well as an increase in extreme weather events such as heat-waves, floods and droughts. As a result:

- up to 100 million people worldwide could be at risk of flooding by the 2080s;
- in Bangladesh, for example, a 1.5m sea-level rise would lead to displacement of 17% of the population; and
- between 75 and 250 million people in Africa could face increased pressure on water resources as early as the 2020s, while rain-fed agriculture could have yields reduced by 50% in some countries.

1.12 These regional impacts will have global repercussions as we see the growth of environment related migration. Regional impacts could also create potential disruptions to international production and trade.

1.13 Taking urgent action to mitigate the effects of climate change is the only strategy consistent with long-term economic growth and global stability. The UK's views on a long-term international framework for tackling climate change are set out in Box 1.2

BOX 1.2: BUILDING A LONG-TERM INTERNATIONAL FRAMEWORK FOR TACKLING CLIMATE CHANGE

We need to work with other nations to establish an international framework to tackle climate change from 2012 onwards (once the first Kyoto commitment period comes to an end). It will need to be consistent with the principle of common but differentiated responsibilities established in the UN Framework Convention on Climate Change.

The UK considers that there are five essential elements to this framework:

- A shared vision of the **long-term goal for stabilising greenhouse gas emissions** to provide a yardstick for international efforts and give certainty to business about the future direction of travel;
- **carbon pricing and emissions trading**; establishing a global carbon price would stimulate investment by the private sector in clean technology and energy efficiency. Emissions trading, driven by deeper emissions targets in developed countries, could generate significant transfer of resources to developing countries through innovative mechanisms such as the Clean Development Mechanism;



BOX 1.2 CONTINUED

- international cooperation on **technology and energy efficiency** to stimulate and accelerate research and deployment of low carbon technologies and overcome barriers to cost-effective action to reduce demand for energy;
- incentives for **sustainable forestry management** that reflect the value of avoiding deforestation; and
- support for developing countries to **adapt to the unavoidable impacts** of climate change.

More detail on these issues and the Government's wider international climate change work programme can be found at <http://www.defra.gov.uk/environment/climatechange/internat/index.htm>

Securing energy supply

1.14 On current trends, world demand for energy is set to increase by 53% between 2004 and 2030. Even if action is taken to save energy, reflecting the need to reduce emissions, a significant increase in demand is still likely, requiring a substantial response in energy supplies.

1.15 The IEA¹⁷ reports that global oil and gas reserves are sufficient to sustain economic growth for the foreseeable future. But they are concentrated in relatively few locations around the world (see Box 1.3)

BOX 1.3 PRIMARY ENERGY RESERVES

Proven oil reserves are concentrated in the Middle East and North Africa, together accounting for over 62% of the world total. As a result, the OPEC* share of global oil production is projected to increase from 40% in 2006 to around 50% in 2030**. Outside OPEC, only Russia, Central Asia, Latin America, and Canada are likely to achieve any significant long-term increases in oil production.

Although natural gas resources are more widely dispersed than oil, some 56% of proven reserves are found in just three countries: Russia, Iran and Qatar. Liquefied Natural Gas (LNG) – which can be transported by tanker – is set to play a more important role in future. However, because pipelines will remain the principal means of transporting gas, gas markets will remain regional in the short to medium-term.

By contrast, coal is found in very many countries around the world and is easily transported. For these reasons, coal already provides 40% of global electricity and is likely to play an important role in the world's energy mix for many years to come. But its emissions are high: over twice those produced by burning gas. Further improvements in the efficiency of coal-fired generation and technologies such as carbon capture and storage will be necessary if the world is to make good use of fossil fuel to provide reliable energy without undermining climate security (see chapter 5.4).

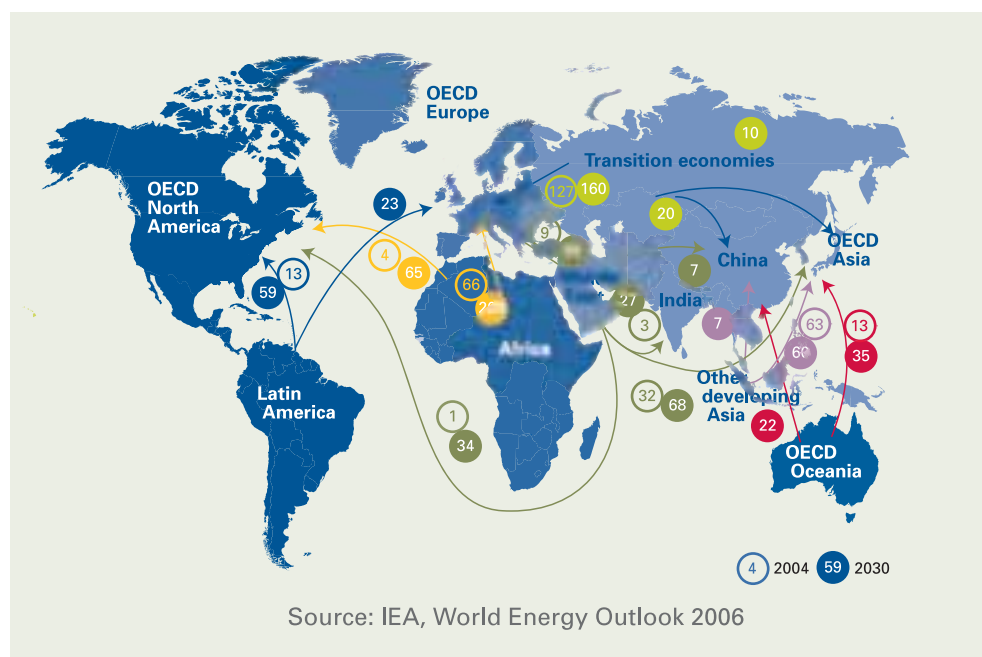
* Organisation of Petroleum Exporting Countries

** IEA, *World Energy Outlook*

17 Resources to Reserves – *Oil and Gas Technologies for the Energy Markets of the Future*, IEA 2005

1.16 The future pattern of energy supply and demand points to a growing mismatch between the regions in which energy is needed and those in which natural resources are located. As a result, we can expect to see increasing trade in fossil fuels between regions of the world. Longer supply lines, will increase the risk and impact of disruptions to energy supplies. Figure 1 gives an impression of the regional energy flows for gas in 2030 as forecast by the IEA.

FIGURE 1.1 REGIONAL ENERGY FLOWS OF GAS (2004 AND 2030) – IEA WORLD ENERGY OUTLOOK, 2006 (BILLION CUBIC METERS)



1.17 Our security of supply challenge, therefore, lies in recovering and bringing energy resources to market. The IEA estimates that between 2005 and 2030, worldwide investment of over \$8 trillion is required in the gas and oil sectors, and over \$11 trillion in the power sector, much of which is likely to be in developing countries¹⁸.

1.18 A number of risks have the potential to defer or restrict the level of future energy investment which could undermine the reliability of future energy supplies:

- **Oil and gas supplies are concentrated** in regions which include less stable parts of the world;
- **resource nationalism** is rising, with a greater degree of state intervention restricting or discriminating against equal access to resources. Energy reliability may be affected if energy reserves are used for political ends which conflict with commercial objectives;
- the role of '**national champions**' in natural resource production brings risks because, nationalised industries lack the incentives to exploit natural resources in the most efficient manner, or to produce the same levels of investment. They may also be more susceptible to political influence;
- significant **market power**, including over reserves and the use of pipelines for energy transportation, enables some countries to exert significant influence over prices and supply. Co-ordination between a number of



supplier countries about production levels and investment decisions could increase their market power, reducing market effectiveness;

- **inadequate information** about the production, consumption and stocks of fuels can exacerbate fluctuations in oil and gas prices. This volatility can deter long-term investments;
- **regulatory uncertainty** can also undermine confidence amongst investors. While there is a consensus emerging that our climate is changing, views about the direction of climate policies and their potential impact on the demand for energy differ sharply between energy-consuming and producing nations; and
- the threat of **terrorism, accident and natural disaster** can: increase the likelihood of supply disruptions, particularly when energy is being moved across great distances; hamper investment; and increase the costs of oil and gas production.

How will these trends and risks affect the UK?

1.19 As our own natural resources decline, and are only partly replaced by indigenous supplies of energy such as wind, the UK will become more dependent on imported fuels to meet its energy demand. By 2020, around 80% of our fuels are likely to come from overseas.¹⁹

1.20 As a result, the UK will face greater exposure to developments in the global energy system, including other countries' reactions to global trends.

In particular:

- The UK faces the costs of dealing with the impacts of sustained increases in global emissions:
 - direct costs, such as storm damage, implementing protection measures (such as coastal defences) and the loss of valuable low-lying land under rising sea levels;
 - the loss in value of assets in areas most at risk from climate change impacts and the associated increase in insurance costs; and
 - a share in the global costs of managing accelerating immigration, as populations are forced from their homes;
- consumers could face higher and more volatile energy prices not only because of higher demand and the need to exploit resources in more challenging circumstances, but because of insufficient investment and less efficient methods of production and transportation;
- international relationships with both consuming and producing nations on a wide range of issues may become more complex, if energy supply is used as a political lever; and
- the UK will be more vulnerable to the risk and impact of overseas disruptions to energy supplies in future, caused by international disputes, accidents or terrorism, as supply routes become longer and cross more borders.

¹⁹ Based on DTI baseline projections of energy demand and domestic production (without measures included in this White Paper). See *UK Energy and CO₂ Emissions Projections*, May 2007 www.dti.gov.uk/energy/whitepaper

Our international energy and climate strategy

1.21 Our new international energy and climate change strategy is designed to ensure security of energy supply and accelerate the transition to a low-carbon global economy. This Government has long been active in promoting the need for integrated climate and energy policies on the international stage, particularly through Europe (see Box 1.4). We need to do more to save energy, but demand will continue to rise, and we must promote investment to secure supplies of energy consistent with economic growth, while reducing emissions. The measures required to achieve this will need to be put in place over the next two decades.

BOX 1.4 EU ENERGY POLICY

At the summit led by the UK in 2005, EU leaders gave the European Commission a mandate to develop a common energy policy for the first time. In March 2007, the European Council approved an ambitious climate change and energy package to build a low carbon economy in Europe. The Council agreed:

- That developed countries should continue to take the lead by reducing their greenhouse gas emissions by 30% by 2020 compared to 1990 levels with a view to reducing them by 60% to 80% by 2050;
- that the EU should cut greenhouse gas emissions by 30% by 2020 compared to 1990 levels in the context of a global and comprehensive international agreement; and make a firm independent commitment to cut greenhouse gases by at least 20% by 2020;
- to implement the EU's energy efficiency action plan as the means of reducing the EU's energy consumption by 20% by 2020; and
- on a binding target of a 20% share of renewable energies in overall EU consumption by 2020, and a 10% minimum binding target for the use of biofuels.

The Council also welcomed the Commission's intention to establish a mechanism to stimulate the construction and operation by 2015 of up to 12 demonstration plants of CCS technologies in commercial power generation, with the ambition for all new fossil fuel plants to be fitted with CCS by 2020, if it is technically and economically feasible to do so (see section 5.4).

We are already in discussion with European counterparts on these issues. In parallel we are conducting detailed analysis to explore how the agreement can be implemented in the most effective way, and how the UK can best contribute to it. We shall be engaging actively with interested parties, including energy producers and users, in taking this work forward.



1.22 Our international strategy is built around four main elements:

1. Promoting open, competitive energy markets which provide fair access to energy supplies, foster investment throughout the energy supply chain and deliver diverse, reliable supplies at competitive prices. Governments are responsible for establishing the market framework, based on clear, stable and non-discriminatory rules, and for the effective regulation of the market. Effective markets will ensure that the world's finite natural resources are used in the most efficient way and ensure that we make the transition to a low carbon economy at least cost. Governments also have a role in planning for contingencies (such as major disruption to supplies), where markets alone would be unable to manage the impact.

2. Taking action to put a value on carbon emissions. It is for governments to ensure that the costs of environmental damage caused by carbon emissions are taken into account by consumers and businesses. Establishing a price for carbon provides an incentive to use energy more efficiently and ensures investments reflect the costs of climate change. This enables low-carbon technologies to compete with other forms of energy production, reducing emissions and improving our energy security.

3. Driving investment to accelerate the deployment of low carbon technologies. We need to bring about a step-change in global investment in low carbon technologies, including renewables. This will help ensure that the UK and other nations benefit from a diverse supply of low carbon technologies, including those which enable the use of fossil fuels in ways which are consistent with reducing greenhouse gas emissions. Governments have a role in supporting research, development and demonstration of near commercial and new technologies, as well as scaling up international collaboration to promote the deployment of existing low-carbon products.

4. Promoting policies to improve energy efficiency. This is the most cost-effective means of tackling emissions while improving energy security. We need to work in cooperation with other governments and with businesses throughout the supply chain to set high environmental standards, encouraging innovation and competition to phase out the least efficient products, as well as share experience about market and other mechanisms to encourage the efficient use of energy. We will work with developing nations to find ways to secure reliable and affordable energy supplies which contribute to sustainable growth and poverty reduction. We will encourage them to move beyond older technologies to acquire the most efficient and sustainable solutions as a first choice in their economic development.

Open, competitive energy markets

1.23 In order to create the right framework for investment, our priorities are to:

- establish fully liberalised European energy markets by 2010;
- extend the application of market principles beyond the boundaries of the European Union;
- improve market-functioning and transparency in the global oil and gas markets;
- promote good governance, including investment, amongst producer countries; and
- ensure there is a robust assessment of our exposure to risks, as the UK imports more fuel, and consolidate international plans for contingencies.

1.24 An open European market is essential to ensure that the UK can draw on adequate and competitively priced supplies of gas to meet demand. Without it, we face the threat of supply disruptions and volatile prices. It is now generally recognised that further action is necessary to achieve full liberalisation. We therefore welcome the strong action the European Commission is taking to enforce the package of EU legislation passed in 2003, and its taking decisive action when competition rules are broken. We strongly support the proposals set out in the Commission's Strategic Energy Review, endorsed at the EU Spring Council in March 2007.

1.25 **To ensure a fully liberalised European market by 2010**, we will:

- Support more effective unbundling. When one company owns energy production, supply and the transmission networks, it has an incentive to exclude new entrants to the market. We believe the most effective way to prevent this situation is to ensure that the company which owns and operates the network has no production or supply interests - "ownership unbundling";
- support proposals to increase the powers of EU regulators to the highest level and improve co-operation between regulators. At present EU regulators are only responsible for protecting national consumers and many have limited powers;
- increase transparency to enable greater cooperation between transmission system operators in Europe. Common network standards and access to transmission and distribution systems must be developed and made binding in order to increase network security across the EU; and
- promote consumer choice to ensure that all EU non-domestic consumers have a real choice as to their supplier.



1.26 To extend the application of market principles beyond EU boundaries, we will:

- Support wider membership of the Energy Community Treaty²⁰ to include countries such as Ukraine and Turkey, and work with EU member states in using this Treaty as a potential model for other areas;
- continue to raise the profile of energy within the Euromed partnership and campaign for full engagement by all participants;²¹
- work to establish a process which encourages countries such as Azerbaijan, Kazakhstan and Turkmenistan to determine and develop their gas and oil potential and to facilitate the development of new transit infrastructure, in the interests of enhanced competition and more diverse supplies into Europe; and
- maintain our advocacy of open and competitive markets by encouraging greater implementation and wider membership of the Energy Charter Treaty²² and ensure that negotiations on a new set of Partnership and Co-operation (trade) agreements with third countries (beginning with Russia in 2007) reflect its principles.

1.27 To improve market-functioning and transparency further, we will:

- support international efforts to improve the consistency and clarity of reporting on global oil and gas reserves;
- promote the UK as an attractive market for LNG, including as a gateway to Europe through inter-connectors;
- work through the International Energy Forum to promote better understanding about future demand for energy, particularly in relation to the impact of climate change policies; and
- support the proposal included in the European Commission's Strategic Energy Review, to establish an Office of the Energy Observatory to collate and monitor data on the energy supply and demand balance across the EU, in the short and medium term, and identify the potential need for future investment.

²⁰ Details available at www.energy-community.org

²¹ The Euromed energy partnership is part of wider efforts to develop a free-market area covering North Africa, Turkey, Syria, Jordan, Egypt, Israel, the Palestinian Authority and Lebanon. Euromed should encourage inward investment in the region, and enhance Europe's security of supply.

²² Details available at www.encharter.org

1.28 **To build on and improve our contingencies planning**, we will:

- support the IEA's efforts to encourage non-member countries (such as China and India) to develop and maintain complementary contingency arrangements, as the proportion of oil consumed outside the OECD continues to rise; and
- use the newly established EU network of energy security correspondents²³ and membership of multilateral organisations to share information about risks to energy security.

1.29 **To promote good governance amongst producer countries**, we will campaign for the Extractive Industries Transparency Initiative (EITI)²⁴ to become a global standard, to ensure that oil, gas and mining revenues contribute to sustainable development, poverty reduction and therefore, political stability. In particular, we will:

- work to engage China, Russia, India, Brazil and South Africa whose state-owned companies are increasingly important global players;
- campaign for a UN General Assembly resolution on extractive industry revenue transparency to strengthen international action; and
- monitor energy sector governance in major producing countries and be prepared to offer UK advice and expertise where necessary or requested.

Putting a value on carbon

1.30 Our priorities are to:

- achieve agreement for the EU to adopt a more ambitious carbon trading scheme in Europe to serve as the basis for an effective global carbon market; and
- move toward a truly global carbon market which delivers an effective carbon price internationally by:
 - encouraging the development and subsequent linking of national and regional emissions trading schemes; and
 - improving developing country participation through improvements to the Clean Development Mechanism (CDM)²⁵ to provide greater certainty and continuity in the market.

1.31 The best way to encourage a change in investment patterns towards a low-carbon economy, and the most cost-effective way of reducing global emissions, is to establish a price for carbon. Credible, long-term frameworks for tackling climate change provide clear signals to industry about the future path of emissions. Trading mechanisms such as the EU ETS and the CDM allow cost-effective sharing of the burden of reducing carbon emissions. In addition, the CDM provides a valuable means of securing low-cost emissions reductions, while promoting the deployment of low carbon technologies in developing countries. Alongside the development of a global carbon market, a range of other policies and regulatory measures will play an important role in ensuring energy efficiency the deployment of low-carbon energy.

²³ An EU network designed to monitor and exchange information about international risks affecting the Union's energy security to ensure that the Union can take timely action when faced with specific, identifiable threats.

²⁴ Details available at www.eitransparency.org

²⁵ CDM is a mechanism that allows developed nations to achieve part of their greenhouse gas emissions reduction obligations under the Kyoto Protocol by funding projects in developing countries that reduce emissions



1.32 We are clear about the need to strengthen the EU ETS to deliver a meaningful carbon price as part of the Commission's wider set of energy policy commitments and targets. By engaging business in the process of developing our position we can understand how best to strengthen the EU ETS to give business longer-term predictability for their investment decisions. Continuing to streamline the scheme in line with better regulation principles will also reduce administrative burdens and improve the cost effectiveness of the scheme.

1.33 We want the EU to:

- Agree a new and ambitious Directive. This will be based on proposals which the Commission should bring forward as soon as possible;
- make early decisions on emissions caps to provide business with confidence that there will be a meaningful long-term carbon price. Announcing our long-term intentions for the EU ETS will provide early certainty for investors in low carbon technologies and signal EU-wide commitment to reduce carbon emissions beyond 2012. We need to signal the downward direction of EU emissions reductions much further into the future;
- set EU ETS caps to help deliver the EU's commitment to cut its greenhouse gas emissions in a cost-effective manner by 30% by 2020, in conjunction with other industrialised countries (and a 20% reduction in any event). The carbon constraint imposed by EU ETS should tighten over time;
- move towards increased auctioning of allowances in future phases of the EU ETS to improve the efficiency of allocating allowances, while taking account of competitiveness implications;
- allow carbon capture and storage installations to be brought within the scope of the EU ETS during Phase II, and for them to be explicitly recognised in the Directive from Phase III;
- explore the potential to expand the scheme to cover additional sources of emissions, including surface transport, and press ahead with the inclusion of aviation;
- consider the scope for greater harmonisation of the ways in which member states operate the scheme, particularly in areas such as allocation, to tackle concerns about competitiveness impacts; and
- move to ensure the EU ETS is at the centre of a global carbon market post-2012, by considering how the Directive should be amended to facilitate the future linking of EU ETS to other schemes.

1.34 Full details of our strategy to strengthen EU ETS are set out in Annex C to this White Paper. In March 2007, we published a paper calling for views on some of the key issues we believe are important to the future operation of the Scheme.²⁶ This will further develop our understanding of the views of industry, NGOs and other interested parties.

1.35 We are confident that the EU ETS will evolve to deliver a robust long-term carbon price signal to investors. However, we will keep open the option of further measures to reinforce the operation of the EU ETS in the UK if this should be necessary to provide greater certainty to investors.

²⁶ Available on Defra website at <http://www.defra.gov.uk/environment/climatechange/trading/eu/future/review/index.htm#5>

1.36 To scale up and reform the Clean Development Mechanism to provide greater certainty and continuity in the market, we will:

- work through the EU to strengthen the EU ETS to stimulate demand for CDM credits;
- press the UN to ensure that CDM credits from projects registered before 2012 will remain valid after 2012 and therefore be eligible for compliance in ETS Phase III;
- support development and piloting of new trading instruments which facilitate enhanced participation of developing countries, including different ways of crediting emissions reductions within the CDM, such as programmatic and sectoral approaches;
- press the UN on early recognition of carbon capture and storage as a low carbon technology in the CDM in order to support its demonstration and deployment in major emerging economies such as China and India; and
- seek to ensure that the UN project mechanisms including the CDM, deliver real emission reductions. The UK supports the continued improvement in the procedures for the setting of baselines, and for the establishment of additionality. Increased transparency and public scrutiny can also play an important role in ensuring high standards are met.

Driving investment to accelerate the deployment of low carbon technologies

1.37 Our priority is to overcome the barriers to the deployment of low-carbon technologies, in developing countries and in particular to:

- promote the development and deployment of near commercial and new technologies;
- create the right incentives for private sector investment, as well as directly supporting the development of new technologies where this is justified; and
- mobilise finance for low-carbon energy investment on a wide scale, including through creating policy and regulatory incentives.

1.38 The bulk of the investment necessary to deliver energy and climate security will come from the private sector. But governments have a responsibility to create the right incentives and frameworks to enable a rapid transition to a low carbon economy. While putting a value on carbon can help to “pull” investment towards low carbon technologies, there is also a role for governments in “pushing” that investment, by encouraging research, development, demonstration and deployment of these technologies. There are considerable benefits from international collaboration given the large costs involved.

1.39 Analysis in the Stern Review suggested that, in 2004, around \$33 billion was spent worldwide on supporting low-carbon energy technology deployment. This public support needs to be doubled at least, and may need to increase five-fold, over the next 20 years to encourage private investment and deployment at the necessary level.



1.40 We welcome the agreement by the European Council, in March 2007, to set stretching targets for tackling greenhouse gas emissions. The Council also agreed a package of measures for advancing the deployment of low carbon technologies, including CCS (see Box 1.5) and renewables. In particular, the Council agreed that the EU should have a binding target for 20% of its energy consumption by 2020 to be met by renewables. The target covers the energy we use in heat and transport as well as electricity. They also agreed a 10% binding minimum target, to be achieved by all Member States, for the share of biofuels in EU petrol and diesel consumption; this is subject to conditions, including that the production of biofuels is sustainable.

1.41 The 20% renewables target is an ambitious goal representing a large increase in Member States' renewables capacity. Latest data show that the current share of renewables in the UK's total energy mix is around 2% and for the EU as a whole around 6%²⁷. Projections indicate that, on the basis of existing policies in the UK and the EU, by 2020, renewables would contribute around 5% of the UK's and are unlikely to exceed 10% of the EU's consumption²⁸.

1.42 In developing proposals for the renewables target, the Commission will need, as agreed by the European Council, to give due regard to a fair and adequate allocation, taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix.

1.43 After a decision has been reached on each Member State's contribution to the EU Spring Council agreement, it is very likely that the UK will need to take further measures, beyond those set out in this White Paper. We will bring forward appropriate policies to increase the share of renewable electricity, heat and transport, in our mix by 2020 and make our contribution to meeting this target. We shall need to make efforts across the whole spectrum of energy policy from energy efficiency to the development of a wide range of energy technologies. In the meantime, the measures and market framework set out in this White Paper allow us to make significant progress in deploying renewables.

BOX 1.5 CARBON CAPTURE AND STORAGE (CCS)

It is in our own vital interest that the technologies necessary to make coal generation low carbon are developed and deployed as rapidly as possible, since fossil fuels will continue to be a significant part of the energy mix globally for some time to come (on the basis of governments' present policies, fossil fuels will provide almost 70% of global electricity demand by 2030)*.

* IEA, *World Energy Outlook 2006*

27 The current UK figure is from the *Digest of United Kingdom Energy Statistics (DUKES)*, 2006.

The current European figures come from Eurostat. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0_1136239_0_45571447&_dad=portal&_schema=PORTAL

28 The 2020 projections for the UK figure is based on DTI projections – for more detail see 'UK Energy and CO₂ Emissions Projections', May 2007 <http://www.dti.gov.uk/energy/whitepaper>. The 2020 projections for the European figures comes from the EU Commission Renewable Energy Road Map. 'Renewable energies in the 21st century: building a more sustainable future' COM(2006)848 final.

BOX 1.5 continued

The development and wide-scale deployment of carbon capture and storage is therefore important for our climate change and energy security objectives, since CCS has the potential to reduce carbon dioxide emissions from fossil fuel power stations by as much as 90%. We therefore need to drive the development and deployment of low carbon technologies that can be applied to fossil fuel fired power generation including CCS.

In March 2007 the European Council agreed to strengthen Research and Development and develop the necessary technical, economic and regulatory framework to deploy CCS by 2020. The Council also welcomed the Commission's intention to establish a mechanism to stimulate the construction and operation by 2015 of up to 12 demonstration plants of CCS technologies in commercial power generation, with the ambition for all new fossil-fuel plants to be fitted with CCS by 2020, if it is technically and economically feasible to do so. The UK Government committed in the Budget in 2007 to launch a competition to support the commercial scale demonstration of CCS. When operational, this will make the UK a world leader in this globally important technology (see section 5.4 for further details).

The UK welcomes the EU aspiration and considers the UK demonstration to be a potential contribution to this approach. In addition, we would like to see the EU-China Near Zero Emissions Coal (NZEC) demonstration closely coordinated with the wider European demonstration effort. China is a crucial partner for collaboration as its domestic energy security is heavily dependent on rapidly expanding coal fired power generation which has significant implications for future carbon dioxide emission levels.

NZEC was announced in September 2005 at the EU-China Summit. It is expected to result in the construction of the first CCS demonstration project outside the OECD by 2020. The project has three phases:

- Phase 1 (2006–2008) – to identify early demonstration opportunities;
- Phase 2 (2009–2010) – to define, plan and design the project; and
- Phase 3 (2011 onwards) – to construct and operate the project.

Phase 1 is already underway with €1.5 million of EU funding and a UK contribution of £3.5 million.

The project is making good progress. The detailed scope has been agreed with our Chinese partner, the Ministry of Science and Technology, and the procurement process for European partners has been completed. We will announce details of the successful consortia shortly.

Other international outreach and collaborative initiatives are set out in section 5.4.

1.44 To overcome global barriers to the development and deployment of low carbon technologies, to create the right incentives and to mobilise finance for clean investment on a wide scale, we will:



- promote and exploit international sources of collaborative funding such as the EU Framework Programme and lending from the European Investment Bank. We are actively participating in the development of the first EU Joint Technology Initiatives to extend EU support into demonstration of low-carbon energy technologies;
- transform UK funding of research and development, increasing levels of investment and bringing together public and private sector contributions; and
- consider how to reduce tariffs and other barriers to the trade of low carbon goods and services, and so accelerate the deployment of low-carbon technologies.

1.45 The new Energy Technologies Institute will seek international opportunities to deliver its remit on research and development. As well as supporting innovation and energy efficiency, the UK's new Environmental Transformation Fund will help development and poverty reduction through environmental protection in developing countries. In addition, we will:

- disseminate the lessons learned from UK technology development among major emerging economies, sharing policy expertise and our understanding of economic incentives;
- work in partnership through multilateral organizations such as the IEA, the Carbon Sequestration Leadership Forum and the International Partnership for the Hydrogen Economy to share knowledge and to overcome barriers to deployment;
- work with emerging economies like China and India to deliver collaborative research and development, building on UK technology expertise. DTI and the UK's energy research organisations will make an announcement later this year about a joint programme of funding for collaborative R&D with developing countries;
- work with developing countries and relevant organisations to develop new mechanisms to assist their efforts in adopting a low-carbon development path; and
- work with the international finance institutions (for example the World Bank's Clean Energy for Development Investment Framework)²⁹, to scale up financing for low carbon energy projects in developing countries including by the the private sector.

Promoting energy efficiency

1.46 Our priorities are to:

- achieve the EU target of saving 20% of the EU's energy consumption by 2020 by improving energy efficiency across member states;
- push for the rapid implementation of five priorities contained within the EU Energy Efficiency Action Plan: transport; improved efficiency requirements for equipment; improving consumers' energy-saving behaviour; technology and innovation; and realising potential energy savings from buildings in order to complement and facilitate action in the UK;

²⁹ The Clean Energy for Development Investment Framework aims to increase access to modern energy in Africa, help large emerging economies adopt low carbon energy options and help countries to adapt to the impacts of climate change. In March 2007, the World Bank produced an action plan leading up to the G8 Summit in Japan in 2008.

- work with G8 partners to implement the actions agreed at the Gleneagles Summit in 2005 and at St Petersburg in 2006 and commit to further efforts to promote energy efficiency; and
- continue to work with the international development community to improve access to clean energy and increase energy efficiency in the developing world.

1.47 Increasing our energy efficiency is the least expensive and most immediate way of addressing all of our energy and climate goals simultaneously. Saving energy reduces carbon emissions, cuts fuel bills for consumers and boosts profits for business. The IEA has estimated that global energy demand would be 50% higher today, without the energy savings achieved since 1973. And there is substantial potential for further savings to be made. Energy efficiency is a crucial element of our international strategy. We therefore support the Commission's proposal to develop an International Framework Agreement on Energy Efficiency with both developing and developed countries.

1.48 To help ensure rapid implementation of the EU Energy Efficiency Action Plan, we will:

- Press for adoption and implementation of the new EU minimum energy performance standards for 14 priority product groups including boilers, water heaters, consumer electronics, copying machines, televisions, stand-by modes, chargers, lighting, electric motors and other products by the end of 2008 (see also chapter 2) and where possible, raise standards by voluntary actions, in advance of EU regulations;
- improve consumer product information, for example, through updating and broadening of the EU Energy Labelling Framework Directive and stimulate innovation and competition in the supply chain to provide more energy efficient goods and services;
- realise significant energy-saving potential in the buildings and transport sectors, in particular by:
 - supporting the EU move to expand the scope of the Energy Performance of Buildings Directive;
 - encouraging the adoption of an ambitious market transformation strategy to deliver zero-carbon new homes across the EU; and
 - improving vehicle efficiency standards;
- drive energy efficiency in the energy intensive sectors through strengthening the EU Emissions Trading Scheme;
- help small and medium-sized businesses to finance energy efficiency investments by working with European financial institutions; and
- ensure energy efficiency is given greater attention in the EU's external relations and dialogues with energy producers and consumers and support and help facilitate an international framework agreement for energy efficiency to act as a high level platform for international co-operation and collaboration.

1.49 To implement the priorities agreed at Gleneagles in 2005 and St Petersburg in 2006, we will work with G8 partners to:

- Implement the IEAs "One Watt Initiative" by helping to develop and by adopting practical standards for stand-by power consumption for new appliances to be one watt or less by 2010;



- develop coherent product policy measures, through the International Task Force on Sustainable Products and through other co-operative mechanisms, which are effective in providing reliable consumer information and in driving up efficiency standards, including for set-top boxes and digital televisions, energy efficient lighting and fuel-efficient tyres;
- adopt ambitious standards for energy efficiency in buildings and promote a shift to low and zero-carbon homes;
- develop and deploy cleaner, more efficient and lower-emitting vehicles, whilst raising consumer awareness of the environmental impact of their vehicle choices;
- take forward further recommendations for action from the International Energy Agency expected in 2007 and 2008; and
- enhance international co-operation on energy efficiency by working closely with key emerging economies.

1.50 To improve access to clean energy, especially for poor households and communities, we will work with the international development community to:

- Use effectively the new Infrastructure Consortium for Africa, to address critical constraints to the provision of regional infrastructure in Africa and provide a platform for brokering investments, including in clean energy production such as hydropower;
- commence in 2007 a five-year, £3.8m energy research programme to improve access to reliable and affordable energy services in developing countries, especially in rural areas using renewable energy resources;
- launch a 4-year £4m energy partnership programme aimed at starting and growing small and medium sized energy service enterprises in low-income developing countries;
- increase attention to energy within European Union development assistance programmes, such as through our support for the EU Energy Initiative in the promotion of sound and affordable national and regional energy policies in Africa. This includes efforts to make use of local and natural resources including renewable energy to improve access; and
- identify the options and implications of producing liquid fuels from crops as a possible way of reducing developing countries' reliance on imported fossil fuels.

BOX 1.6 ACCESS TO ENERGY FOR DEVELOPING COUNTRIES

In developing countries, the lack of reliable and affordable energy supplies and services is both a cause and a symptom of poverty. The IEA estimates that about 1.6 billion people – a quarter of the world's population – have no electricity in their homes. A far greater number of people – about 2.4 billion – collect basic biomass fuel (such as charcoal, wood, straw and animal waste) for their daily heating and cooking. We are working with the international development community such as the United Nations, the World Bank and other international finance institutions and with the European Community to improve access to clean energy, especially for poor households and communities. We have helped to set up a new Infrastructure Consortium for Africa, with a secretariat now established in the African Development Bank.

Taking this agenda forward

1.51 Our place in Europe, and our ability to influence through Europe, is of particular importance. We benefit by being part of a larger energy market and by speaking to other governments with a common voice.

1.52 Our relationships with the world's major economies will remain important.

- As a net importer of energy, the **United States** shares our interest in the efficient operation of energy markets. The Federal Government has a strong track record in long-term development of energy technology, such as hydrogen fuel cells, building on America's strength in commercial innovation. The United State's experience – and view about the need for urgent action to tackle climate change – will be significant in developing a multilateral framework for action beyond 2012.
- So too will be the support and leadership of **Japan**, under whose presidency G8 leaders will receive a report on international co-operation since the Gleneagles summit. We want this report to make a positive contribution to discussions within the United Nations about a framework for addressing climate change beyond 2012.

1.53 We will also take an active role in multilateral discussions. The international institutions have an increasingly important role as energy and climate security are recognised as global challenges. They can play a vital role not only in generating evidence, but facilitating the development of new policies and encouraging collaboration where it is needed most:

- The Kyoto Protocol is a very important milestone: a treaty, ratified in 150 countries, which sets legally binding targets and timetables to reduce emissions for developed countries. But this can only be a first step – since the first commitment period runs only to 2012. By then, global emissions are expected to have reduced by only 5%. **The United Nations Framework Convention on Climate Change** offers a process to agree action beyond this date. We will campaign for a comprehensive post-2012 framework agreement which will move more investment into low-carbon energy (see Box 1.2);
- the **International Energy Agency** offers independent policy advice to the OECD member countries. It continues to play an important role in co-ordinating measures to deal with international oil supply emergencies. But its remit is changing, as energy markets develop. We will support the IEA's proposals to increase capacity in gas market analysis, in its work on sustainable energy, including supporting international collaboration on new technologies, and its outreach to major producers and consumers of energy outside OECD, particularly India and China; and
- **the International Energy Forum** is unique in bringing together all of the world's major energy-producing and consuming nations, including those of the OECD, OPEC, Russia, China and India, among others. As a member of the Secretariat's Executive Board, the UK will look to focus the biennial ministerial debate in ways which help to tackle regulatory uncertainty and promote investment.



Summary of our international energy and climate Strategy:

Maintaining security of energy supplies and avoiding dangerous climate change are the greatest challenges facing the international community. A successful global transition to a low-carbon economy will require urgent and ambitious international action. The UK will take a lead in influencing the international community to respond to the challenge, working particularly closely with and through the European Union, to:

- **promote open, competitive energy markets which provide fair access to energy supplies and foster investment and deliver secure supplies at competitive prices;**
- **take action to put a value on carbon emissions to ensure that investment decisions fully reflect the costs of climate change;**
- **drive investment to accelerate the deployment of low carbon energy technologies; and**
- **promote policies to improve energy efficiency, to cut emissions and reduce our dependence on fossil fuels, consistent with economic growth.**

Saving energy

Using energy more efficiently is a cost effective way of cutting carbon dioxide emissions. It can also improve productivity and can contribute to the security of our energy supplies by reducing our reliance on imported energy and ensuring we make maximum use of our own and global energy resources. Improving the energy efficiency of homes can also reduce energy bills and help ensure that the most vulnerable can afford to heat their homes.

2.1 This chapter sets out how we will:

- help businesses and households understand the link between their own actions and climate change and how they can become more energy efficient — ensuring they have the support and information they need to make the right choices;
- provide greater incentives for energy suppliers to deliver energy efficiency improvements in the home and for businesses to invest in energy efficiency measures;
- use the Government's procurement power to stimulate the energy, buildings and products markets to deliver more energy efficient, lower carbon solutions to our future energy needs; and
- stimulate innovation and competition in the supply chain by setting out now the future energy performance standards we expect of our homes, buildings and the products used in them. (Energy efficiency in transport is covered in chapter 7).

2.2 The Devolved Administrations have an important role to play in respect of energy efficiency. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals in this chapter which touch on devolved matters will be progressed in accordance with the principles set out in the Memorandum of Understanding.

2.3 Increased energy efficiency has already made a significant contribution to our energy and climate change goals. Existing energy saving policies and measures from our Energy Efficiency Action Plan³⁰ and the Climate Change Programme Review³¹ will stimulate energy efficiency in businesses, the public sector and households and will together reduce carbon emissions by up to 10 million tonnes of carbon (MtC), accounting for 40% of total UK carbon savings by 2010. By 2020, we expect these policies to deliver around 12–13 MtC reduction in carbon emissions compared to business as usual.

30 Defra (2004) Energy Efficiency: The Government's Plan for Action. Cm6168.

31 Defra (2006) Climate Change. The UK Programme 2006. Cm 6764



FIGURE 2.1 CARBON EMISSIONS FROM THE UK ECONOMY (NETCEN 2004, INCLUDES INTERNATIONAL AVIATION AND SHIPPING) 168.3 MTC PER YEAR

Source: NETCEN 2004

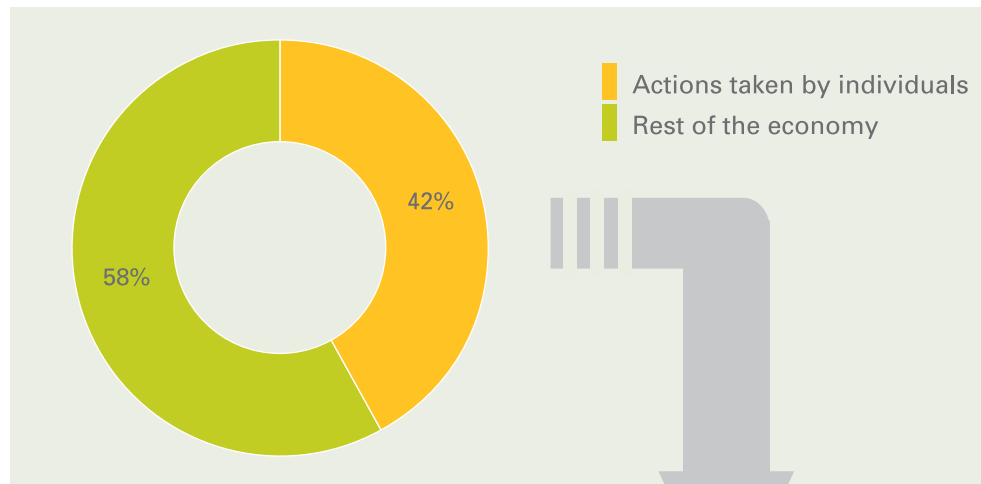
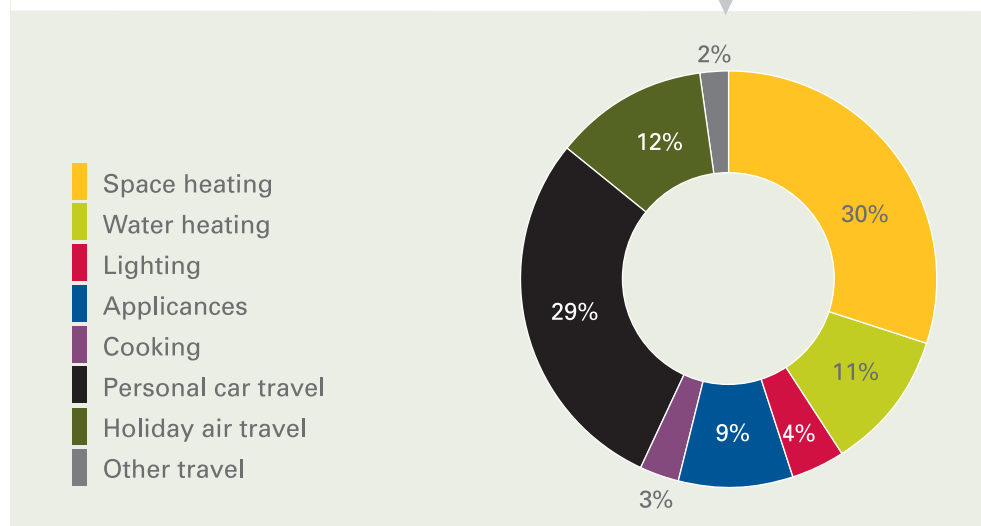


FIGURE 2.2 INDIVIDUAL ANNUAL CARBON EMISSIONS, AVERAGE PER CAPITA CARBON EMISSIONS IN 2005: 1.16 TONNES OF CARBON PER YEAR



Source: Defra

In the home, three-quarters of carbon dioxide emissions come from the energy used for heating and providing hot water and a fifth from lighting and appliances. Domestic energy consumption has been increasing slowly but steadily since the 1970s largely as a result of the spread of installed central heating and the increase in the number of energy-using goods (see also Figure 2.2). As a result of Government action, through measures such as the Energy Efficiency Commitment and improvements to building standards, we expect domestic energy consumption and carbon emissions to fall by 2010. However, if we are to see a large enough reduction in carbon emissions from this sector in order to help meet our 2020 and 2050 goals, we need to continue action beyond 2010 to improve energy efficiency.

Energy Efficiency: the potential

2.4 In the Energy Review Report we estimated that there is the potential to make further cost effective cuts in our carbon emissions through energy efficiency. As technologies develop, the non-energy intensive business sector could save up to 5 MtC and the public sector 1 MtC by 2020 through adoption of cost-effective energy efficiency improvements. The Carbon Trust estimates that businesses in the UK waste some 10–20% of the energy they buy through poor control of heating, air conditioning and ventilation and through leaving lights and appliances on when not in use.

2.5 Collectively, individuals are responsible for over 40% of the UK's energy use and carbon dioxide emissions (see Figure 2.1). The Energy Saving Trust estimates that at home we waste over £900 million per year by leaving appliances on when not in use. Our analysis for the Energy Review Report indicated that through energy efficiency and behavioural measures to reduce waste, households could save a further 9 MtC a year by 2020 and cut their energy bills at the same time.

2.6 Improving energy efficiency requires everyone – individuals, businesses and Government to take action. Individuals and businesses can play their part in reducing the waste of energy, by investing in energy efficiency measures for the home and workplace and by choosing to purchase more energy efficient buildings and products. Government will encourage and enable action by businesses and individuals by providing the right information and ensuring that the regulatory framework is in place to incentivise action and to deliver continuing improvements to the energy efficiency of buildings and products.

Energy efficiency: the barriers

2.7 Our analysis for the Energy Efficiency Innovation Review³² suggests that there are several key barriers currently hindering greater take up of energy efficiency amongst both businesses and individuals. Issues of behaviour and motivation are significant barriers to investment in large organisations; energy saving is rarely core business. For small and medium-sized enterprises (SMEs), hidden costs, such as management time, are a common barrier. For the manufacturing sector finance is an important issue while in the commercial sector, where use of energy in buildings predominates, lack of information, split incentives (e.g. between the landlord who would make the investment and the tenant who would benefit) and motivation are key barriers. For the individual, lack of information and motivation are primary barriers.

2.8 To achieve the potential energy savings that we have identified requires a mix of policies designed to stimulate change to:

- create incentives and reduce barriers to greater energy efficiency by businesses, individuals and government;
- support more energy efficient choices through improved awareness,



- information and services which can deliver energy efficiency; and
- focus the Government's procurement power to help deliver greater energy efficiency in buildings and products and to support our ambition for greater use of renewable power.

2.9 For the long-term we set out our commitment to:

- raise the energy efficiency standards of our future building stock and of the products we buy.

Saving energy – business

2.10 As part of our drive to reduce carbon emissions, the Government is committed to providing a clear, flexible and stable policy framework within which businesses can make cost-effective long-term planning and investment decisions. This is why, on 13 March 2007, the Government published its draft Climate Change Bill which sets out clearly our long-term targets to reduce carbon emissions. We are also committed to ensuring that emissions reductions are delivered in the most cost-effective manner possible. We believe that the use of carbon pricing and emissions trading, such as through the EU ETS, provides a cost effective means of delivering carbon savings. In keeping with the Government's better regulation agenda, we are undertaking a review of our major climate change policies to ensure that they continue to be effective and that the regulatory burden on business is kept to a minimum.

2.11 Business commitments to tackling climate change are growing, with more companies making voluntary climate change agreements and public statements of action to achieve low carbon or carbon neutral businesses. The UK Corporate Leaders' Group on Climate Change have argued that investing in a low-carbon future should be "a strategic business objective for UK plc as a whole". On 24 April 2007, the Climate Group launched a campaign with business leaders, communities and Government; "We're in this together"³³ details businesses' commitments to provide practical ways for individuals to reduce their carbon footprint.

2.12 Industrial energy consumption has fallen by 47% since 1970 and by 14% since 1990. In contrast, demand for energy by the service sector has increased³⁴. Since 1980, electricity and gas consumption in the services sector have both increased by about 80%³⁵.

2.13 Many firms recognise the benefits that investment in energy efficiency can bring, through lower costs, improved competitiveness and improved social and corporate standing. However, short-term cost considerations, lack of information and market failures can act as barriers to investment.

2.14 To overcome these, the Government recognises that it has a role to play: firstly, by creating the right incentives for long-term investment in cost-effective energy efficiency measures; secondly, by raising awareness, and

³³ <http://www.together.com/>

³⁴ The service sector includes both commercial and public services

³⁵ DTI (2006) Digest of UK Energy Statistics. <http://www.dti.gov.uk/energy/dukes06.pdf>

enabling business to make more energy efficient choices through provision of better information on energy use and climate change; and thirdly, by setting now the future regulatory framework that will drive improvements in the energy efficiency of commercial buildings and products.

Creating incentives to reduce emissions

2.15 The Climate Change Levy (CCL) was introduced in 2001 to encourage businesses to reduce energy demand. Subsequently the EU made it a requirement for all Member States to tax the business use of energy. To maintain the levy's environmental impact, from 1 April 2007 CCL rates are being increased on a yearly basis in line with inflation.

2.16 We now have Climate Change Agreements with over 50 industrial sectors. The current agreements will run until 2013. Participants receive an 80% discount from the Climate Change Levy, provided that they meet either their carbon emissions or energy efficiency targets. To ensure these targets remain challenging but realistic, they are periodically reviewed and the current 2010 targets will be reviewed in 2008. Subject to State Aid approval, participants meeting their 2010 targets will continue to receive the CCL discount until March 2013.

2.17 These existing measures have been instrumental in tackling emissions from the energy intensive industrial sectors but do not effectively target carbon emission reductions from the wider business and public sectors. The Energy Efficiency Innovation Review demonstrated that there are significant opportunities in the large non-energy intensive sectors to improve energy efficiency which are not currently being exploited.

The Carbon Reduction Commitment

2.18 In the Energy Review Report, Government committed to deliver carbon savings of 1.2 MtC per year by 2020 from large commercial and public sector organisations.

2.19 Our consultation on potential measures for achieving these reductions³⁶ indicated strong support for a mandatory rather than a voluntary measure. Government has therefore decided to implement a UK mandatory cap and trade scheme, the Carbon Reduction Commitment (CRC), to secure the 1.2 MtC per year in 2020³⁷. We will seek enabling powers under the draft Climate Change Bill to introduce these new trading arrangements.

2.20 To minimise administrative burdens, a key issue raised during the consultation process, we will focus the scheme on large organisations for whom energy efficiency benefits would outweigh administrative costs.

36 Our analysis supporting this consultation together with consultation responses can be found at: <http://www.defra.gov.uk/environment/climatechange/trading/index.htm>

37 We will deliver the total savings of 1.2MtC through a combination of the CRC, delivering 1MtC and the Energy Performance of Buildings Directive which will deliver around 0.2MtC.



CRC will therefore target emissions from energy use only by organisations whose mandatory half hourly metered electricity consumption is greater than 6000 MWh per year. This would generally capture organisations with annual electricity bills above £500,000.

2.21 Government proposes that CRC will target both carbon emissions from direct energy use as well as indirect carbon emissions (i.e. from electricity). To avoid overlap with existing measures, the CRC would target neither emissions covered by the Climate Change Agreements nor direct emissions covered by the EU Emissions Trading Scheme. In addition, organisations with over 25% of their energy use emissions in Climate Change Agreements would be completely exempt.

2.22 To further minimise administrative burdens, CRC allowances will be issued to participants via an auction process. Participants will be able to determine their own emissions targets within the scheme. CRC will also allow self-certification of monitoring, reporting and verification of energy use and emissions, backed by an independent risk-based audit regime.

2.23 CRC will be broadly revenue neutral to the Exchequer. The auction revenue will be recycled to participants by means of a simple, direct, annual payment proportional to average annual emissions since the start of the scheme, with a bonus/penalty depending on the organisation's position in a CRC league table.

2.24 In order to ease participants into the new regime, and to allow Government to establish more accurate data on emissions across the target sector, CRC will feature an introductory phase, with a simple fixed-price sale of allowances. In addition, the Government proposes a safety valve to avoid spikes in the price of allowances. The Commitment will feature a moderated buy-only link to the EU ETS, through which the CRC participants will be able to buy allowances at the higher of the prevailing EU ETS price and a minimum CRC floor price. There will be no link between CRC and the existing voluntary UK Emissions Trading Scheme/Climate Change Agreement market.

2.25 In order to ensure delivery of a cost-effective, workable scheme, Government recognises the importance of further consultation with interested parties. We will therefore publish in June a consultation on the detail of how the proposed CRC can best be implemented.

2.26 In relation to coverage and delivery, key areas for further consideration will include: the definition of an organisation within CRC; rules to exempt small sources of emissions; the approach to monitoring, reporting and verification/audit; and for local authorities, the treatment of street lighting within CRC.

2.27 In terms of market design, areas for further consultation include auction and league table design – which government recognises is a key issue. We will also consult on the length of the gap between auction payment and revenue recycling in recognition of concerns raised during the consultation. Analysis indicates that retaining at least a six month gap is necessary to maintain the signalling effect of the CRC auction.

2.28 We will use the experience we gain from the first phase of the CRC to determine whether, over time, it would be cost effective and proportionate to extend the scheme to organisations with lower energy consumption.

Improving information

2.29 Businesses require tailored and specific information on how best to invest in energy efficiency. Government therefore intends to improve the information made available to businesses on how to improve the energy efficiency of their premises and on their energy usage.

2.30 We will consult later this year on the requirement to display Energy Performance Certificates in business premises in England and Wales. These Certificates will provide an energy rating (from A to G) for these buildings and will set out what steps can be taken to improve their energy efficiency. The information will be an important aid to businesses in meeting their climate change commitments, whether regulatory, such as through the EU ETS or the new CRC, or through voluntary action.

2.31 Government is also working with a range of interested parties to consider how we can improve the wider sustainability of our existing building stock, reducing water requirements as well as energy requirements, for example. We are also working to identify other measures that will reduce the carbon emissions of existing non-domestic buildings, by raising awareness of the ways to improve energy efficiency and by encouraging the take up of energy efficiency measures in workplaces (see Box 2.1).

BOX 2.1 RAISING AWARENESS AT WORK

The Carbon Trust, a Government funded organisation, has worked with Comet Group plc to achieve significant energy savings through staff training and awareness across its 10,000 employees in 260 stores, offices and distribution centres. Together, a core training programme and energy efficiency video were created. The modular training programme was designed to adapt to different building types and varying levels of staff requirements. Examination of half hourly energy data from each store provided the measurement of success achieved through increased awareness. This low cost activity delivered annual savings of over 3,000 tonnes of carbon.



Energy metering in the business sector

2.32 Advanced meters which provide readings on either an automatic half-hourly basis for electricity or on a daily basis for gas are already mandatory for large users of energy. This kind of information, combined with energy saving advice, enables businesses to make informed decisions about investment in energy efficiency and recent evidence supports this (see Box 2.2). Increasingly, suppliers and metering companies are offering such services to smaller energy users.

BOX 2.2 ADVANCED METERING FOR SMEs – A TRIAL BY THE CARBON TRUST

The Carbon Trust conducted a trial of “smart” electricity, gas and water meters with over 580 smaller businesses, providing them with new meters or clip-on devices to record and transmit their energy data. (For a full report see: <http://www.carbontrust.co.uk/default.htm>)

The businesses received accurate and frequent information about energy consumption for at least one year. A proportion also received e-mail, telephone or on-site energy efficiency advice. Over the year, potential carbon savings of 12%, on average, were identified; of these about 3% were realised by those receiving half-hourly data only, but over 7% by those also getting e-mail advice.

The Carbon Trust’s analysis suggests that smart metering would be cost-effective for firms with profile class 5–8³⁸ electricity meters and their equivalents in gas. The sectors with the greatest carbon saving potential are wholesale/retail, manufacturing and financial & business services. Firms with multiple sites can achieve lower costs and greater savings than others. Payback periods for single site SMEs are around four years for gas meters, but longer for electricity meters.

2.33 Government will therefore consult this year on a proposal that energy suppliers should extend to all but the smallest business users in Great Britain and those larger businesses not already subject to half hourly metering, advanced and smart metering services within the next five years. This could achieve annual savings of 0.1–0.2 MtC per year by 2020. We will explore with interested parties what further help should be given to businesses to maximise the use of advanced metering and the savings that can flow from it.

38 Below the mandatory half-hourly electricity metering market (that is, those with maximum electricity demand below 100kWh) suppliers allocate business customers to six profile classes 3-8, based on their electricity consumption. Most business customers fall in classes 3 (with a standard “domestic” meter) and 4 (with an Economy 7-type meter). The electricity consumption of these businesses thus closely resembles that of domestic customers. We propose to exclude business customers with profile class 3 and 4 electricity meters and those non-daily read gas customers whose consumption is less than 73,200 kWh per year.

2.34 The Government will also consider with interested parties what advanced metering services (or other means of providing real time information) might be appropriate for the smallest business users and, if necessary, what might be done to bring about their deployment.

2.35 The Gas and Electricity Markets Authority (GEMA) has statutory responsibilities for ensuring the accuracy and performance of gas and electricity meters. We propose to transfer these responsibilities to the National Weights and Measures Laboratory (NWML), an executive agency of the DTI, when a suitable legislative opportunity arises. This will simplify the regulatory framework by giving a single UK point of contact, through NWML, for business on all the technical aspects of measuring instruments, including meters.

Saving energy – households

2.36 We have already achieved a great deal to help households through policies such as the Energy Efficiency Commitment, Warm Front³⁹ and Decent Homes to deliver energy efficiency improvements to homes in the UK. As a result of Government policy, about half of all homes have benefited from some form of energy efficiency intervention. But there are around eight million homes in the UK that could still benefit from cavity wall insulation⁴⁰. This type of energy efficiency measure pays for itself in less than three years through reduced energy bills and together with other cost-effective measures, such as loft insulation, and more energy-efficient boilers, which we estimate could potentially reduce carbon emissions by up to 9 MtC per year by 2020.

2.37 Government has an important role to play in helping individuals make choices that save energy and reduce their carbon footprint (see Box 2.3): by providing support and assistance to individuals looking to make greener lifestyle choices; by providing information on energy use and its impact on carbon emissions; and by ensuring that the regulatory framework is in place to deliver improvements to the buildings, products and services that individuals can buy.

39 See <http://www.defra.gov.uk/environment/energy/eec/index.htm> and <http://www.defra.gov.uk/environment/energy/hees/index.htm>

40 Review of the Sustainability of Existing Buildings:
http://www.communities.gov.uk/pub/373/TheEnergyEfficiencyofDwellingsInitialAnalysis_id1504373.pdf



BOX 2.3 INDIVIDUAL ACTION

The Government's proposals in this White Paper for supporting individuals to take action are:

We will provide greater support and assistance to individuals by:

- ensuring greater availability to the householder of energy saving measures from energy suppliers through the Carbon Emission Reduction Target;
- extending until 2020 the obligation on suppliers to help make households more energy efficient; and
- improving advice and help to households in reducing emissions.

We will improve awareness of climate change and information on energy use by:

- enabling individuals to measure their carbon footprint through an on-line CO₂ calculator;
- requiring Energy Performance Certificates, which provide information on the energy performance of homes and buildings and the steps that can be taken to improve that performance and reduce energy bills;
- providing historical information on energy bills, requiring energy suppliers to provide free electricity displays and expecting smart electricity and gas meters to be installed within every home over the next decade, all of which will help give households the information they need to save energy.

We will set out now the standards we expect in the future for our homes and the products we use in them:

- driving higher energy efficiency standards for the products we use at home and at work;
- phasing out the use of energy inefficient light bulbs;
- raising building standards to make homes zero carbon – through greater use of energy efficiency and low and zero carbon forms of energy; and
- introducing an ambitious new Planning Policy Statement on Climate Change to help support the development of communities which can make use of low-carbon and renewable sources of energy.

And we will:

- lower the planning barriers to the installation of microgeneration in the home (see chapter 3);
- ensure energy generating householders (i.e. through microgeneration) are rewarded for electricity they sell back to the grid (see chapter 3);
- remove barriers to supplying distributed energy through more flexible market and licensing arrangements (see chapter 3);
- make it easier to find information and advice on distributed generation of energy (see chapter 3); and
- provide advice on smarter driving and new car purchases (see chapter 7).

Improving support and assistance

2.38 We want to see all homes achieve their cost-effective energy efficiency potential. Our intention is that by the end of the next decade, all householders will have been offered help to adopt energy efficiency measures. We will do this through an ambitious programme: increasing the level of delivery by the energy suppliers of energy efficiency measures into the home under the Carbon Emission Reduction Target; extending our obligation on suppliers until at least 2020; raising awareness of climate change and providing households with the information and advice they need through improvements to billing and metering and through Energy Performance Certificates, to improve the energy efficiency of their homes.

Energy Efficiency Commitment/Carbon Emission Reduction Target

2.39 The Energy Efficiency Commitment (EEC) is a key success of the Government's energy efficiency policies to date. This Commitment requires electricity and gas suppliers in Great Britain to achieve targets for the promotion and delivery of energy efficiency into their customers' homes. They can choose from a range of measures in order to deliver their obligation; for example, some have met 20% of their obligation by installing loft or cavity wall insulation while others have met 70% of their target in this way. EEC has also encouraged innovative approaches to the delivery of energy efficiency, including partnerships with Local Authorities, charities and community groups and has provided incentives for the deployment of new innovative energy efficient technologies.

2.40 The EEC has had a range of social benefits, supporting Local Authority objectives under Decent Homes and the Home Energy Conservation Act (see section 2.1 on fuel poverty). Whilst it does not have a specific fuel poverty objective, it does require suppliers to direct 50% of energy savings towards a priority group of low-income customers. Evaluation of the first phase of the EEC suggests that this priority group benefited from reduced energy bills and increased comfort, worth around £1.8 billion.

2.41 EEC phase 1 (which ran from 2002–2005) stimulated about £600 million of investment in energy efficiency and delivered net benefits to householders in excess of £3 billion (see Table 2.1). EEC 2 (2005–2008) requires broadly double the level of activity of EEC 1 and is expected to deliver 0.5 MtC annually in 2010.

2.42 The Climate Change and Sustainable Energy Act 2006 allows the Government to expand the range of measures that can be used by energy suppliers to deliver their commitments under EEC. Following our initial consultation, in July 2006, on the shape of EEC phase 3⁴¹, we launch alongside this White Paper our statutory consultation on a new Carbon Emission Reduction Target (CERT) for energy suppliers for the period 2008–2011. The CERT will replace EEC. It has the same underlying framework and purpose as the EEC, but with an expanded range of measures, including microgeneration



TABLE 2.1: EXPECTED CARBON SAVINGS FROM THE ENERGY EFFICIENCY COMMITMENT/ CARBON EMISSION REDUCTION TARGET, 2002 – 2011

	Expected Carbon savings in 2010 (MtC/y)	
	Original	Revised ⁴²
EEC1 (2002–2005)	0.36	0.3
EEC2 (2005–2008)	0.62	0.5
CERT (2008–2011)	0.9–1.2	1.1 ⁴³

and behavioural measures, within the scheme. It also proposes an increased carbon target on energy suppliers, effectively requiring them to double their current effort, significantly increasing activity in well established markets like insulation and encouraging a big push into new markets like microgeneration. Because of the scale of CERT, even more customers are likely to benefit both directly and indirectly from supplier activity.

2.43 The legislation for CERT is expected to be in force by the end of 2007, allowing Ofgem and energy suppliers to prepare for its start in April 2008.

2.44 To facilitate a smooth transition from EEC2 to CERT, we have already published the carbon savings to be attributed to energy efficiency measures allowed under CERT⁴⁴. We will also allow energy suppliers to start work on their CERT targets early and allow unlimited carry-over of over achievements against their current EEC2 targets.

2.45 The Government has also decided to commence the relevant provisions of the Climate Change and Sustainable Energy Act. This has allowed the Government to include in the statutory consultation on CERT the use of behavioural measures and all forms of microgeneration.

A supplier obligation

2.46 The Government is committed to continuing to deliver carbon savings from the domestic sector using some form of supplier obligation until at least 2020, delivering an annual saving of 3–4 MtC by 2020. As the most cost-effective opportunities to improve energy efficiency are taken up over time, realising energy efficiency savings will become increasingly expensive and difficult to achieve. If we are to continue to deliver carbon savings from households, we need to bring about a change in consumers' approach to energy use.

2.47 We believe that harnessing the opportunities to bring about this change will require a transformation of the market for the supply of domestic energy. Suppliers and customers need to have a shared incentive to reduce domestic emissions, and to work in partnership to achieve this.

⁴² The savings for EEC1 and EEC2 have been reduced slightly following recent research showing that the actual energy savings achieved as a result of insulation are lower than previously assumed.

⁴³ Not final: subject to the outcome of statutory consultation.

⁴⁴ <http://www.defra.gov.uk/environment/energy/eec/pdf/illustrativemix-final2007.pdf>

2.48 Creating this shared incentive will require an innovative policy, which changes the way the supplier views their relationship with the end consumer. Rather than selling units of energy, the suppliers' focus needs to shift to the marketing of energy services. By harnessing opportunities to change householders' behaviour, it will be possible to achieve substantial carbon and energy savings whilst maintaining the level of "energy service" enjoyed by customers. This is possible because customers demand energy for the services it provides: heat, light and power for electrical appliances, rather than demanding energy *per se*.

2.49 Encouraging suppliers to make this shift from compliance with the regulatory requirement to implement energy saving measures, as under EEC, to a model where securing carbon savings offers profitable opportunities will be challenging, and cannot be made in one step. It will require suppliers to develop alternative business models, earning profits through a combination of low carbon measures, related services and sales of energy.

2.50 CERT is a first step towards creating such a marketplace, with its rewards for innovative approaches and domestic microgeneration. The continued obligation on suppliers to 2020 will provide a further incentive to move in this direction, whilst the Carbon Reduction Commitment (CRC) will provide incentives for similar market developments in the commercial sector.

2.51 Market transformation will also require changes to other aspects of energy markets. Steps to improve billing, and over time to roll out smart meters to domestic customers, set out in this White Paper, will improve the opportunities for suppliers to develop alternative business models. Equally, energy services relationships are likely to involve longer-term contracts between suppliers and customers. Such contracts will be further facilitated by Ofgem's proposed removal, in the context of the Supply Licence Review, of the "28 Day Rule"⁴⁵. Removing this rule will make it possible for suppliers to offer more innovative contracts to customers, for example "packages" whereby the supplier makes investments in the customer's home in return for the customer committing to a fixed term contract.

2.52 We are in the process of evaluating the costs and benefits of the various options for a supplier obligation which would further support this market transformation by providing stronger incentives for energy suppliers to reduce the carbon emissions of their customers. The options under consideration include setting supplier targets in terms of absolute reductions in carbon or delivered energy as discussed in the Energy Review Report, as well as alternatives such as a further evolution of the measures-based approach as under EEC and CERT.

2.53 The emerging evidence shows that there are pros and cons for each approach. A cap and trade demand reduction obligation would give suppliers greater flexibility over the measures they choose to deploy and would improve

⁴⁵ This rule requires that all domestic supply contracts must be capable of being terminated with 28 days notice, and so may act as barrier to contracts where suppliers make up-front investments in their customers' homes with the intention of recouping this investment over time.



their incentives to innovate. However it may not promote take-up of those opportunities to cut household carbon emissions that would be most cost-effective over the long-term. EEC has proven strengths, which could be built on by an evolution of a “measures-based” approach. These include a focus on measures with longer-term benefits and the opportunities it offers for suppliers to engage with local authorities, appliance retailers and others in addition to their own customers.

2.54 We intend to reach a clear conclusion on the direction for the post-2011 supplier obligation in 2008. As part of this process a call for evidence will be issued in summer 2007 to enable interested parties to offer their views at an early stage in the policy development process.

BOX 2.4 PERSONAL CARBON ALLOWANCES

The concept of a personal carbon allowance is one of a number of potential long-term ideas undergoing academic research in the UK. Under such a scheme, individuals would manage their own carbon emissions; a national emissions cap would be set, and emissions rights (in the form of carbon credits) would be allocated across the population as a whole. Individuals would surrender their carbon credits upon the purchase of, for example, electricity, gas or transport fuel. Those who need or want to emit more than their allowance would have to buy allowances from those who emit less. Over time, the overall emissions cap (and hence individual allocations) could be reduced in line with international or nationally adopted agreements.

Following the Energy Review Report, the Government commissioned an initial scoping study from the Centre for Sustainable Energy into the feasibility of using personal carbon allowances. Their main findings were that:

- by having an overall cap on carbon, a personal carbon allowance could guarantee a certain reduction in domestic carbon emissions;
- it is unlikely that such an allowance could work in isolation from other policies;
- such a scheme might have the potential to achieve emissions savings in a fairer way than a carbon tax; and
- there is little evidence currently available about key wider issues critical to the success of a personal carbon allowance such as public and political feasibility, technical feasibility, cost, and relative effectiveness.

The Government believes that the current system of taxation strikes the right balance between protecting the environment, protecting the most vulnerable in society and maintaining sound public finances. There remain many high-level questions about whether a personal carbon allowance scheme could be proportionate, effective, socially equitable and financially viable, particularly when compared or combined with existing policies and other options for controlling carbon emissions; whether it could be a

BOX 2.4 continued

practical and feasible option; how such a scheme might work in practice; and whether it would avoid placing undue burdens on individuals. The Government is therefore undertaking a programme of work intending to look into these issues in more detail.

Raising awareness and improving information

2.55 Government is working with the wider public sector, business and voluntary organisations to ensure that consumers are given the right advice and support to understand the impact they have on the environment and allow them to make better, more environmentally friendly lifestyle choices. In particular, the Government is committed to working with Ofgem and the Energy Saving Trust (EST) to ensure consumers have accessible, transparent and user friendly information on the “green electricity” tariffs available to them.

Raising awareness of climate change

2.56 As a key part of our work, the Government is helping individuals understand the link between their own actions, carbon dioxide emissions and climate change. Through the EST we are already engaging with one million households annually, providing advice on energy efficiency and carbon emissions reductions. We are going further: a Government-wide communication campaign, called “Act on CO₂”, is already underway, including events such as a Citizens’ Summit on Climate Change and on-line, press and TV advertising. A web-based CO₂ calculator will be launched shortly together with a new short film and an educational brochure.

2.57 The CO₂ calculator, produced in partnership with the EST (which will be available at <http://www.direct.gov.uk/actonCO2>), provides individuals and households with a profile of their direct CO₂ emissions, based on their lifestyle. The calculator gives tailored recommendations about how these can be reduced. The short film describes the link between individual action and CO₂ emissions and will be distributed through channels such as community groups. To stimulate young people to discuss climate change and global warming, we have sent a pack containing the film, together with Al Gore’s film, “An Inconvenient Truth” and other resources to all secondary schools in England.

2.58 To give greater clarity and assurance to consumers who decide to offset their carbon emissions the Government also consulted on a voluntary Code of Best Practice for carbon offsetting. In order to meet the terms of the proposed code, companies marketing offsetting products would need to fulfil certain criteria, including use of credits from the regulated market (such as those approved by the UN) and provision of specified information to the consumer. We intend to launch the Code by the end of 2007.



2.59 Community level organisations have the potential to play an important role in communicating climate change and in helping their communities make real and lasting changes to their day-to-day lives. Government needs to understand what mobilises individuals to take action and what role community organisations can play in that. In the Energy Review Report, we committed to undertake a study looking at the role of “community level” approaches to mobilising individuals and the role of local authorities in particular, in making them work effectively. Initial findings by the Centre for Sustainable Energy and Community Development Exchange⁴⁶ imply that effective community initiatives are likely to be a necessary component of a coherent national approach to tackling climate change.

Improving information on energy use

2.60 Ensuring householders have direct access to information about their energy use within their homes will enable consumers to manage that use and reduce their carbon emissions. Following our consultation on billing and metering⁴⁷, the Government intends to roll forward a package of measures in Great Britain which will change the way in which energy use is communicated to customers.

2.61 The Government believes that additional information on bills or statements can help customers reduce their energy consumption. We propose that historic information, preferably in graphical form, which compares energy usage in one quarter with the same period in the previous year, should be provided on domestic customers’ energy bills or statements, or, for those customers with internet-based contracts, electronically. We will work with gas and electricity suppliers to incorporate this requirement within supply licences. This measure will deliver annual carbon savings of up to 0.2 MtC by 2020.

2.62 In the Energy Review Report we also said that we would consult on the frequency at which customers are provided with accurate bills and the Government has investigated the levels of actual meter readings. Ofgem advises that, on average, over 87% of customers in the domestic sector receive at least one bill based on an actual meter-read each year. Initiatives such as the Billing Codes of Practice introduced by energy suppliers, together with existing distribution industry codes, are intended to maintain these levels. The Government does not, therefore, propose any further action in this area at this time.

⁴⁶ For detail see <http://www.defra.gov.uk/environment/climatechange/uk/individual/index.htm>

⁴⁷ DTI (2006) *Energy Billing and Metering: Changing Customer Behaviour*.
<http://www.dti.gov.uk/files/file35042.pdf>

BOX 2.5 THE ENERGY DEMAND RESEARCH PROJECT

The Energy Demand Research Project, co-funded by the Government and industry, will involve several thousand households receiving smart meters or feedback devices, displaying real-time energy use. The project, managed by Ofgem on the Government's behalf, will trial different ways of improving billing and metering. The trials will provide information on reductions in energy use that consumers make in response to different forms of feedback about energy usage and will test consumer response to time of use tariffs that encourage energy use to be switched away from peak periods. The latter has the potential to deliver savings by reducing the need for investment in new energy infrastructure to meet peak demand. Final details of the project are currently being negotiated with participating companies, following which the trials will commence swiftly. The project will run for two years, with regular reports on emerging findings and will inform the further development of policy on smart meters and associated feedback devices.

2.63 Suppliers are already rolling out advanced meters in the business sector and are considering the business case for smart meters in the domestic market. The evidence coming from the trials of smart meters and real-time displays (see Box 2.5) will underpin future decisions on smart meter deployment.

2.64 Our expectation is that, within the next 10 years, all domestic energy customers will have smart meters with visual displays of real-time information that allow communication between the meter, the energy supplier and the customer. The display will provide customers with readily accessible information about their energy usage. The Government will work with suppliers, Ofgem and other interested parties in these developments, including through our Energy Demand Research Project. We expect suppliers to roll out smart meters when it is cost-effective to do so and within the timescales we have set.

2.65 Through smart meters, readings can be taken remotely, ensuring that all bills are accurate. Meters can be remotely switched between credit and prepayment, reducing supplier and customer costs. Electricity suppliers will be able to offer new products that may incentivise customers to use less energy at peak times or to use less energy overall.

2.66 We welcome the progress being made by suppliers, with the support of Ofgem, to remove barriers to the roll out of smart metering. Suppliers and manufacturers are also examining the scope for developing communication systems that can be shared between electricity and gas meters, as well as the scope for commercial arrangements to share both communications systems and data between companies.

2.67 In the Energy Review Report, Government stated its intention to discuss with Ofgem, the energy suppliers and interested parties how best to roll out rapidly the provision of real-time electricity displays. Government believes displays should be provided with smart meters in the longer-term, and has considered their role in the shorter-term.



2.68 We believe that customers who are interested in real-time electricity displays should have ready access to them. Whilst the displays are available through retailers, energy suppliers may be in a better position to deliver them cost-effectively to customers, and some suppliers are doing so on a small scale.

2.69 We therefore propose that, from May 2008 and where technically feasible, every household having an electricity meter replaced and every newly built domestic property will be given a real-time electricity display, free of charge. The display must show real-time information about electricity consumption and cost and meet a minimum performance requirement of 95% accuracy in the normal range of energy use by a household.

2.70 In addition, from as soon as possible in 2008 to March 2010, any household requesting a real-time display for their electricity meter should be given one free of charge by their energy supplier. We estimate annual carbon savings from these cost-effective short-term measures of up to 0.3 MtC by 2020. The Government will also consider how to incentivise innovation in relation to household displays of gas consumption and cost.

2.71 Government also supports energy supplier initiatives to offer customers information through transmitting energy use data via digital technology to a television, mobile telephone or personal computer. We will discuss with interested parties what part Government can play beyond the work that is already in hand.

2.72 The Government will consult on the implementation of these proposals in the context of our ambition to see a roll out of smart meters within ten years. The provision of real-time displays with smart meters has the potential to transform how households manage their energy use. Our objective is to see households have access to this new technology as soon as possible to enable them to control their emissions.

2.73 We estimate that these proposals for billing and real-time displays will deliver annual savings of up to 0.4 MtC by 2010, in line with the Government's commitment under the Climate Change Programme; and up to 0.5 MtC by 2020.

2.74 It is possible that some of our metering and billing proposals set out in this White Paper will be taken forward in the context of the implementation of the Energy Services Directive.

Delivering lower carbon homes

2.75 Government believes that empowering and encouraging homeowners to identify potential energy and carbon saving opportunities can increase the uptake of energy efficiency and microgeneration measures.

2.76 To realise this, Government is committed to increasing the provision of support to householders in England and Wales, to make the process of improving the energy efficiency of homes as clear and as easy as possible.

2.77 By requiring all homes put on the market to have an energy rating – similar to the ratings domestic appliances already get – Energy Performance Certificates will give all buyers and renters of homes transparent, accurate information on the energy running costs of their homes, and practical advice on how to improve it, helping them cut their fuel bills and their carbon emissions. The Certificates will apply to new buildings and the sale and rent of existing buildings. Together with the display of certificates in larger public buildings, required under the EU Energy Performance of Buildings Directive, this policy will deliver annual carbon savings of between 0.6 – 1.6 MtC per year by 2020.

2.78 Certificates in themselves are not enough. We are aware of the importance of giving householders the support they need to make the changes recommended within Energy Performance Certificates. Working with Energy Saving Trust and other key participants, we are exploring how we can provide a better service for households that brings together in one place advice on approved local suppliers, information about grants available, advice on microgeneration, as well as signposting householders to other initiatives such as the recently expanded Warm Zones and help from energy suppliers under EEC/CERT.

2.79 The Government has already introduced a reduced rate of VAT for the professional installation of a range of energy saving materials and microgeneration technologies within residential properties. To provide a further incentive to householders, the Government is urging the European Commission and European Finance Ministers to introduce a reduced rate of VAT for energy saving materials for DIY installation.

2.80 Based on our discussions with major banks and building societies, the Government anticipates that these measures, have the potential to create a market for “green” financial products designed to help householders invest in energy efficiency measures and microgeneration.

Saving energy in the public sector

2.81 The public sector generates a fifth of UK Gross Value Added (a measure of economic output), employs a fifth of the UK workforce, and produces 3% of UK carbon dioxide emissions from buildings and official travel.

2.82 Reducing these emissions will not only ensure the public sector plays its role in addressing climate change but also offers the prospect of better value for money for the taxpayer through decreased costs and enhanced public service delivery. Government leadership in this area is also critical to the success of the measures targeting action by consumers and business, and Government can help stimulate the market for more energy efficient buildings, goods and services by using its purchasing power to lever improved standards. Recent reports from the Sustainable Development Commission⁴⁸ and the National Audit Office⁴⁹ illustrate the need for us to do better.

48 See <http://www.sd-commission.org.uk/sdig2006/>

49 NAO (2007) Building for the Future: sustainable construction and refurbishment. HC 324 Session 2006-2007



2.83 In June 2006, targets for the Government estate were announced alongside the report of the Sustainable Procurement Task Force⁵⁰. These targets include commitments by each Department to:

- reduce carbon emissions from their offices by 12.5% by 2010/2011 and by 30% by 2020, relative to 1999/2000 levels, and achieve a carbon neutral central Government office estate by 2012;
- increase energy efficiency per m² by 15% by 2010 and 30% by 2020, relative to 1999/2000 levels;
- reduce carbon emissions from road vehicles used for Government administrative operations by 15% by 2010/2011, relative to 2005/2006 levels.

2.84 The recently published UK Government Sustainable Procurement Action Plan and the HMT report on Transforming Government Procurement form the Government's response to the Task Force. The Action Plan sets out our goal for a low carbon, more resource efficient public sector and our plans for reaching this goal. This includes meeting updated and extended procurement standards for an increased range of products and an ongoing requirement to meet the Office of Government Commerce's common minimum standards for the built environment. These standards incorporate the earlier commitment to procure buildings for the central Government estate in the top quartile of energy performance⁵¹. Progress against the commitments for the Government estate will be scrutinised and reported on by the Sustainable Development Commission.

2.85 Subject to any future investigations by the National Audit Office or Environmental Audit Committee, we will invite the Sustainable Development Commission to conduct a health-check review of our plans and progress in 2008.

2.86 As well as using new and updated efficiency standards in our own procurement activities, Government will promote them to others in the public and private sectors. We will publish, by spring 2008, guidelines setting out criteria for energy efficiency and energy savings to be used by the public sector in its procurement procedures. By providing a ready market for more efficient goods, we aim to stimulate competition amongst manufacturers to bring forward more efficient goods and services. We will also work across Government to address the opportunities that collaboration can bring for more effective electricity and gas procurement.

2.87 The Government and the public sector can show leadership by performing well under existing and new policy frameworks, such as the EU ETS and the Carbon Reduction Commitment. These apply to large public sector organisations, such as large Local Authorities, Universities, Hospitals and central Government Departments.

2.88 The CRC will help the central Government Department estates to achieve their 30% emissions reduction target by 2020, and will complement the 2012 carbon neutral target. Reducing absolute emissions would reduce

50 Defra (2006) *Procuring the Future*, Sustainable Procurement National Action Plan: Recommendations from the Sustainable Procurement Task Force.

51 Defra (2004) *Energy Efficiency: The Government's Plan for Action*. April 2004. Cm 6168

the amount of carbon offsetting that may be required to achieve carbon neutral status. The CRC scheme will give due credit for the use of on-site renewables.

2.89 The Government is already rebuilding and refurbishing every secondary school in the country. As part of this programme, it will put £110 million over the next three years towards testing a bold aim of even higher standards for new and refurbished schools; to reduce their carbon emissions through a combination of energy efficiency, use of renewable energy and offsetting.

2.90 We will also make it a requirement that all future Service Families Accommodation in the UK should meet Rating 3 of the Code for Sustainable Homes. We expect that this would apply to all future contracts let by 2008 at the latest.

2.91 In addition, from April 2008, buildings greater than 1,000m² occupied by public authorities and by institutions providing public services e.g. government offices, hospitals, schools, museums and libraries, will be required to display a certificate showing an energy rating for the building and the steps that can be taken to improve its energy performance. This measure is expected to deliver annual carbon savings of about 0.2 MtC by 2020. We are committed to widening the requirement to all public and private sector buildings where it can be demonstrated that this is cost-effective to do so and will consult on this later this year.

2.92 Our measures will have a direct impact on how the Government spends around £60 billion of its annual budget on procurement of goods and services. Overall, our measures to save energy in the public sector will result in annual savings of between 0.7-1.2 MtC per year by 2020.

Setting the standards for the future

2.93 Government has an important role to play in setting out clear milestones for the future, particularly for improving the energy efficiency of products and buildings. By consulting on our intended policy framework now, we can ensure that the construction industry, product manufacturers and retailers are able to plan to deliver our goals over the next 10–20 years.

Raising products standards

2.94 From their manufacture, through their use and final disposal, consumer goods account for a considerable proportion of the energy that we use in the UK. Minimising the amount of energy and resources consumed during each product's life cycle, through improved design, is therefore critical to the delivery of our policy to cut carbon emissions and to achieve our wider policy objectives for more sustainable consumption and production.

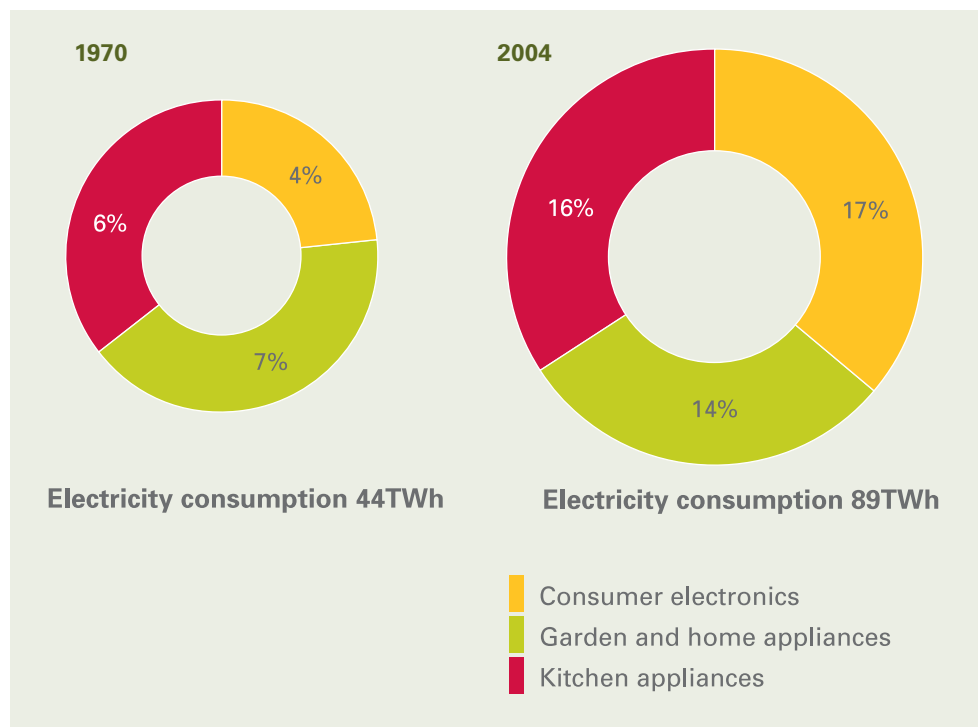
2.95 In the average home the number of energy using appliances has more than doubled since the 1970s (see Figure 2.3) and we expect this trend to continue. Without steps to improve their energy efficiency, by 2010 their total UK energy consumption could exceed 100 TWh.



2.96 Our current analysis suggests that by raising product standards we could reduce annual emissions by between 1–3 MtC by 2020. To do this will require a range of measures and approaches, including: international agreements; European and domestic legislation; and voluntary action through the supply chain to enhance markets for more cost-effective energy efficient goods and services.

2.97 We will focus our efforts on the major energy using products such as motors, lights, household appliances, electronics and air conditioning. These are internationally traded goods. So, while the Government will take steps domestically to improve take up of energy efficient products, we need to work internationally and through the EU to stimulate global innovation and competition to raise standards and to bring greater choice and efficient products to UK consumers.

FIGURE 2.3 ELECTRICAL PRODUCTS IN THE UK HOME AND THEIR TOTAL UK ELECTRICITY CONSUMPTION, 1970 AND 2004



Source: Energy Saving Trust report, *Rise of the machines*

2.98 Working through the International Task Force on Sustainable Products we will deliver on our Gleneagles G8 commitments to promote international cooperation on product labelling and standards and help develop practical standards to reduce stand-by power and to implement the International Energy Agency's (IEA) 1 Watt initiative.

2.99 The European directive on the Eco-Design of Energy-using Products (the EuP directive) will deliver mandatory measures to improve the energy efficiency of a range of products. Our immediate priorities in Europe are to press for rapid delivery of mandatory measures to improve energy efficiency and to reduce stand-by power and improve lighting standards. While we welcome the European Commission's stated intention to work towards regulating against inefficient bulbs by 2010, with a phase out over the following years, we intend to take action in the UK in advance of this.

2.100 We are working closely with UK manufacturers, retailers and trade associations to be the first European country to phase out inefficient GLS bulbs for the majority of domestic use, where an efficient alternative exists, by 2011. This will reduce annual UK carbon emissions by up to 1.2 MtC by 2020 and lead to a saving of around £30 on the average household energy bill. To encourage the purchase of low energy light bulbs, the Government has written to the European Commission and European Finance Ministers to recommend the introduction of a reduced rate of VAT for energy-efficient products.

2.101 Domestically we will also deliver changes to the UK market for other energy using products. As announced in the Budget in 2006, we will do this by working with the UK supply chain and seek commitments from manufacturers, retailers and service providers to deliver more efficient goods and services. We have met with the major UK retailers of electronic and electrical goods; all have agreed to look in more detail at the energy consumption of the products they are selling and at the scope for action. Many retailers are already responding to this challenge by raising the issues with their own suppliers and with firm commitments to encourage more efficient lighting and other products.

2.102 To support this work, Government, through our Market Transformation Programme (MTP), will publish a series of consultation papers setting out our analysis of how the performance of energy using products will need to improve over the next 10–20 years, including proposals for product standards and targets to phase out the least efficient products. These standards will, for example, guide our priorities for European action and for commitments we are seeking from UK business. These will be updated annually. We are publishing alongside this White Paper our first consultation paper, which focuses on the consumer electronics sector. This sets out how we expect the performance of major consumer electronics available in the UK to improve over the next 13 years including televisions, video players/recorders, digital TV adapters (set-top boxes) and external power supplies/battery chargers. If the proposals set out in the consultation paper were implemented this could save up to 1.6 MtC per year by 2020 if all products were to meet earliest best practice levels of performance. For example, through promoting technological improvement we are aiming to reduce the stand by power requirement of new TVs by 85% by 2015, compared to today's average.



BOX 2.6 MEETING PRODUCT STANDARDS

As part of our work with retailers and manufacturers we have been exploring how we might translate the sometimes complex sets of technical standards and energy efficiency targets into an understandable and practical business planning tool. We are examining the development of an “online calculator” (<http://www.mtprog.com>). This could be used by retailers, manufacturers and others to test, easily, if individual energy-using products or their range of products will meet the Government’s published indicative product standards (e.g. for stand-by power and energy efficiency).

The calculator could be used to examine the scope for changing performance specifications or sales volumes in order to improve the overall carbon footprint of the range of products supplied. The calculator might also provide a convenient way for retailers and manufacturers to provide information to Government about their achievements and future plans to raise product standards.

Raising building standards

2.103 Changes to Building Regulations in England and Wales in 2006 have achieved a 70% improvement in the energy efficiency of new houses compared to pre-1990 standards. At 2006 prices, the average 2-bedroomed semi-detached house built in 1970 would cost £515 per year to heat and emit 1.2MtC/yr compared to a house built to 2006 Building Regulations which would cost £85 per year and emit only 0.2MtC/yr. Of the UK’s carbon emissions, 45% are from buildings, with housing making up 27% and the non-domestic sector 18%, so tackling their emissions will make a significant impact on our carbon goals. We need to ensure that developments in the future are as energy efficient as possible; this includes the estimated nine million new homes to be built between now and 2050⁵².

Delivering zero carbon homes

2.104 In the consultation “Building a Greener Future: *Towards Zero Carbon Development*”⁵³, we propose future changes to Building Regulations such that by 2016, all new homes built in England will have to be zero carbon. This means that, over a year, the net carbon emissions from all energy use in the home would be zero (heating, lighting, hot water, and all appliances), achieved by improving the energy performance of the home and increasing the use of renewable and low carbon sources of energy, either installed in the individual home or supplied to an entire development.

⁵² Source:

http://www.communities.gov.uk/pub/173/BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf

⁵³ <http://www.communities.gov.uk/index.asp?id=1505157>.

2.105 The consultation document proposed interim steps to be set out in progressive changes to Building Regulations; by 2010, all new homes would show a 25% improvement in energy performance compared to current Building Regulations and, by 2013, a 44% improvement. Our initial estimates are that these measures could reduce annual emissions by between 1.1 and 1.2 million tonnes of carbon (MtC) by 2020.

2.106 The Government is currently considering responses to the consultation and intends to announce its policy on the timetable for zero carbon housing later this year. We will consult on the details of the next set of changes to Part L of the Building Regulations in 2008.

2.107 The Code for Sustainable Homes⁵⁴ provides a single national standard to guide industry in the design and construction of sustainable homes, considering not just energy but water, materials, waste and ecology. It is a means of driving continuous improvement, greater innovation and exemplary achievement in home building. The Code sets out what is expected to be required to meet future Building Regulations.

2.108 There are six star ratings in the Code (see Table 2.2), each with mandatory minimum standards for energy efficiency and water efficiency. Code Rating 3 should be achievable via energy efficiency improvements to the design, construction and fabric of the building. To go beyond that rating would require not only improved energy efficiency but also some form of low or zero carbon energy generation, either within individual buildings (e.g. dedicated solar water heating) or provided to whole developments through a shared source of low carbon generation (e.g. wind turbines), thus helping the deployment of low carbon technologies and encouraging greater distributed forms of energy generation (see chapter 3). A 6-star home would be a completely zero carbon home.

TABLE 2.2: MINIMUM ENERGY/CARBON STANDARDS IN THE CODE FOR SUSTAINABLE HOMES

Code Star Rating	Standard (percentage better than Part L 2006 ⁵⁵)
1	10
2	18
3	25
4	44
5	100 ⁵⁶
6	A zero carbon home ⁵⁷

54 Code for Sustainable Homes - A step-change in sustainable home building practice" Communities and Local Government - December 2006.

<http://www.planningportal.gov.uk/england/professionals/en/1115314116927.html>.

55 Building Regulations: Approved Document L (2006) - "Conservation of Fuel and Power."

http://www.communities.gov.uk/pub/339/ApprovedDocumentL2AConservationoffuelandpowerNewbuildingsotherthandwellings2006n_id1164339.pdf.

56 Zero emissions in relation to Building Regulations, i.e. zero emissions from heating, hot water, ventilation and lighting.

57 A completely zero carbon home, i.e. zero net emissions of carbon dioxide from all energy use in the home including from appliances.



2.109 The Budget in 2007 announced that from 1 October 2007 all new homes meeting the zero carbon standard costing up to £500,000 will pay no stamp duty, and zero-carbon homes costing in excess of £500,000 will receive a reduction in their stamp duty bill of £15,000. The criteria for eligibility for the stamp duty exemption were published in the Budget⁵⁸.

2.110 The Government will use the Code to support housing developments which are under our own control. In particular:

- we will now make it a condition of Government funding that all new homes built by registered social landlords and other developers and all new homes developed by English Partnerships will comply with Rating 3 of the Code for Sustainable Homes;
- we will require that the 2012 Olympic Village will meet at least Rating 3 of the Code; and
- the Communities and Local Government Carbon Challenge (Design for Manufacture II) will focus on delivering over 1,000 homes on an initial five sites owned by English Partnerships, achieving low or zero carbon status as well as enhanced environmental standards (Rating 5 of the Code for Sustainable Homes). It will also take forward the standards of the earlier Design for Manufacture competition.

2.111 Government is considering whether, from April 2008, all new homes should be required to have a rating against the Code. This would provide a rating of the overall sustainability of the home and would, as a component, use the energy assessment carried out to determine the rating of the home for an Energy Performance Certificate. We will consult on specific proposals by the end of 2007.

2.112 If Building Regulations are to have an impact on carbon emissions then it is important there is a high level of compliance. Amendments were made in April 2006 to the regulations to simplify procedures. In parallel, over the 2005/2006 period, the Government delivered the largest ever training and dissemination programme to improve awareness, understanding, and compliance with new Building Regulations.

2.113 We will review implementation within three years. This will allow for a sufficient population of buildings to be constructed to the new standards. In the interim we will obtain feedback from building control bodies and other stakeholders on the new compliance package and consider how best to assess the impacts they have had.

2.114 Furthermore, we intend to introduce an extended time limit, via a new Building Regulation, which will allow local authorities more time for prosecutions against breaches of those parts of Buildings Regulations dealing with energy efficiency aspects. We will consult on these proposals later this year.

⁵⁸ Budget note 26, http://www.hm-treasury.gov.uk/media/757/0A/bud07_budgetnotes_381.pdf

Delivering low and zero carbon communities

2.115 Delivering low and zero carbon homes requires not just changes to and enforcement of Building Regulations. Our consultation on a draft Planning Policy Statement (PPS): *Planning and Climate Change*⁵⁹, sets out a clear and challenging role for regional and local planning authorities in England to help develop communities with lower carbon emissions, focusing on reducing the need for travel and making best use of low carbon and renewable energy. The Government is currently considering responses to the Planning and Climate Change consultation, and will publish the final PPS this year.

2.116 To encourage investment and confidence in the potential building of low and zero carbon communities across the UK, the Government has commissioned a feasibility study. Using Thames Gateway as an exemplar, the study will look at the potential to turn the area into a low carbon/zero carbon development⁶⁰. The study will define what is meant by low and zero carbon for the Gateway and highlight the major role distributed power generation can play in achieving low carbon development.

2.117 The economies of scale afforded by this development provide the opportunity to go further and faster towards low carbon communities. The feasibility study should also highlight the opportunities for reducing emissions from existing buildings within the Gateway and for new environmental technologies and low carbon businesses.

2.118 A new programme of work is being initiated across Government, led by the Technology Strategy Board – the Innovation Platform on Low Impact Buildings – which will accelerate the development of cost-effective solutions to building zero carbon homes, and will tackle key challenges to upgrading of the existing stock; for example, there are seven million solid-walled homes in the UK which are technically difficult to insulate. This 5–7 year programme will support research where there are clear innovation gaps and will build on existing work, such as the EST's Best Practice Programme and microgeneration field trials. It will act as a technology accelerator by testing clusters of new technologies in a number of Government – funded demonstrator programmes, such as those run by English Partnerships and through measures such as public procurement, will create markets for successful commercialisation of these new technologies.

2.119 In tandem, the Office of Science and Innovation is running the Foresight Sustainable Energy Management and the Built Environment Project. This will explore the technological and social impact of future systems for low carbon generation of heat and power and their interaction with current energy systems⁶¹, with the aim of determining how the UK built environment can evolve over the next five decades towards sustainable, low carbon energy systems.

59 Draft Planning Policy Statement (PPS): Planning and Climate Change.
<http://www.communities.gov.uk/index.asp?id=1505140>

60 Thames Gateway Interim Plan: Policy Framework. <http://www.communities.gov.uk/index.asp?id=1504558>

61 More information is available at <http://www.foresight.gov.uk/Energy/Energy.html>.



Next Steps

2.120 Full implementation of all these measures would result in annual carbon savings of between 7.0–11.7 MtC by 2020, some 30–35% of the savings we expect from the measures set out in this White Paper. This represents a considerable proportion of the energy efficiency potential that we identified in the Energy Review Report. Policies such as zero carbon homes, the opening up of new energy services markets and the feed through of new technologies from our demonstration and research programmes will help not only to unlock the remaining potential but deliver further potential in the future.

2.121 The carbon savings achieved from the energy efficiency measures set out in this white paper comprise:

- 4.7–7.6 MtC from the household sector;
- 1.6–2.9 MtC from the business sector; and
- 0.7–1.2 MtC from the public sector.

2.122 In addition to the development of the policies we have set out in this chapter, in order to comply with the EU Energy End-Use Efficiency and Energy Services Directive, we will:

- produce a National Energy Efficiency Action Plan for submission to the European Commission by 30 June, setting out the policies and measures in place in the UK to deliver improvements in energy efficiency and meet the energy saving target in the Directive; and,
- look at the possible need for additional energy efficiency measures in the transport, business and household sectors, on which we expect to consult this summer.

Saving energy

Summary of measures

We will:

- **Drive energy saving behaviour in the large non-energy intensive sector through introduction of the Carbon Reduction Commitment;**
- **Drive further energy efficiency improvements in the home through a continued obligation on energy suppliers until at least 2020, with a Call for Evidence on how we can deliver this in summer 2007;**
- **Require Energy Performance Certificates for all buildings, to be sold or rented, providing an energy efficiency rating for the property;**
- **Improve information to the consumer on energy use in homes and businesses through improvements to energy metering and billing and the launch of an online CO₂ calculator;**
- **Between 2008-2010, require energy suppliers to provide a free real-time electricity display to all home owners who ask for one;**
- **Publish by spring 2008, public sector procurement criteria for energy efficiency and energy savings;**
- **Publish targets to drive the energy efficiency of products and services. The first of these, for consumer electronics, is published today;**
- **Work with manufacturers, retailers and service providers to obtain supply chain commitments to meet the targets;**

- **Ensure that all new Government funding for homes built by registered social landlords and other developers is made on the condition that they comply with Rating level 3 of the Code for Sustainable Homes;**
- **As of April this year, require that all new homes developed by English Partnerships or with direct funding from the Government's housing growth programmes comply with Rating level 3 of the Code for Sustainable Homes; and**
- **Decide by the end of this year on the date for all new homes to be zero carbon.**

Section 2.1 – Fuel Poverty

2.1.1 Every household in the UK should be able to heat and light their homes affordably. However, for some people, meeting this basic energy need accounts for a disproportionate amount of their income. The generally accepted definition of fuel poverty is when a household has to spend 10% or more of its income on energy to maintain a warm home. The root causes of fuel poverty are the cost of fuel, the income of the household and the energy efficiency of the home.

2.1.2 The Government's UK Fuel Poverty Strategy, published in November 2001 set out our targets on fuel poverty and how we would tackle the problem. We remain committed to enabling all households to afford to heat their home adequately.

2.1.3 This section sets out the progress which has been made to date to tackle fuel poverty and the scale of the problem which still exists in the UK. It also reports on progress since the Energy Review Report, as well as our short and medium term policies to tackle fuel poverty and reach those most in need.

2.1.4 The Government has contributed significant investment and put in place a range of policies which are having an increasing impact, namely:

- the Winter Fuel Payment for those over 60;
- the increased focus on Benefit Entitlement Checks in fuel poverty programmes, including effective interaction with the Pension Service;
- the personal tax package measures announced in the budget earlier this year will have taken up to 100,000 households out of fuel poverty in the UK;⁶²
- the Warm Front programme and its equivalents in the Devolved Administrations;
- the measures directed towards the Priority Group of vulnerable customers under the Energy Efficiency Commitment;
- the Decent Homes Standard; and
- the additional £300 million made available to fuel poverty programmes in the 2005 pre-budget report, taking funding in England alone to over £800 million over 2005–2008.



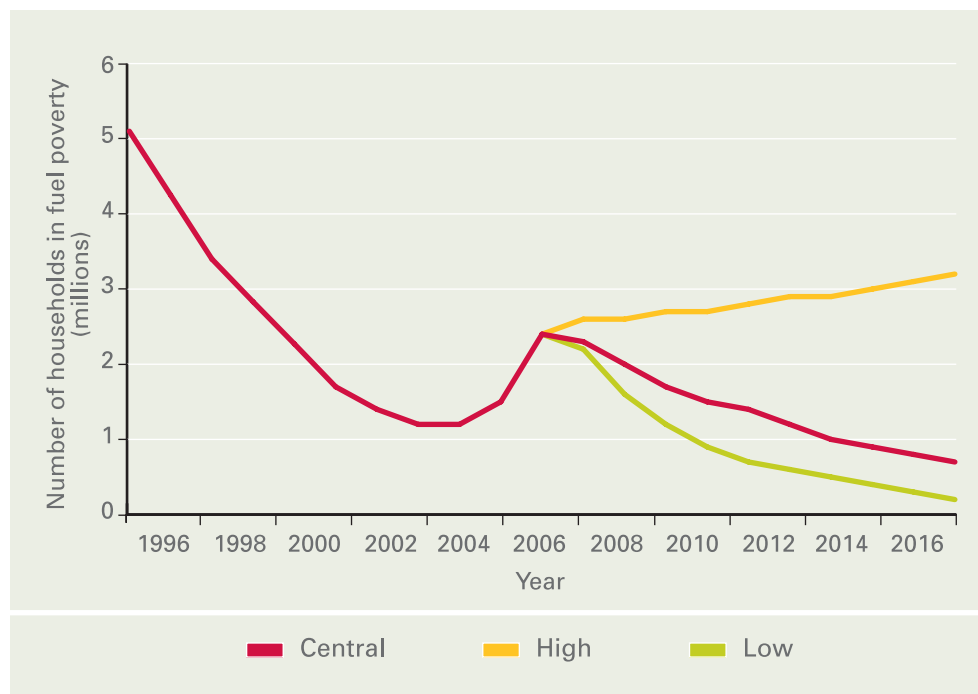
Progress To Date

2.1.5 Since 1996, we have made good progress towards our fuel poverty targets, having reduced the number of households in the UK in fuel poverty from around 6½ million in 1996 to around 2 million in 2004.

2.1.6 However, over the period 2004 to 2006, overall costs of fuel and light increased by 35%, while gas prices increased by 45% and electricity prices by 29% in real terms. These price increases represent significant challenges to our fuel poverty targets.

2.1.7 The increases are estimated to have driven up total fuel poverty levels by around 1.6 million households in England alone, with income improvements offsetting this by around 300,000 households and energy efficiency improvements by a further 100,000 households. This leads to an estimated additional 1.2 million households in fuel poverty in 2006 compared to 2004. The position, for England, between 1996 and 2016 is shown in Figure 2.1.1. On the central price/income scenario it is estimated that 1.5 million households will remain in fuel poverty in 2010 and 700,000 in 2016. This includes the effect of installing energy efficiency measures currently available under fuel poverty programmes. It is clear that households remaining in fuel poverty will need to receive additional assistance if we are to meet our targets.

FIGURE 2.1.1 HISTORIC AND PROJECTED NUMBERS OF HOUSEHOLDS IN FUEL POVERTY IN ENGLAND, 1996-2016



Source: DTI, 2007

- Positions in 2005 and 2006 are based on the modelling of the impact of income, energy prices movements and energy efficiency measures on the number of vulnerable households in fuel poverty.
- Positions from 2007 to 2016 are based on modelling and show central, low and high price scenarios. These are based on the fossil-fuel price assumptions published at the same time as the White Paper.

2.1.8 Other factors affecting progress include:

- households not taking up their entitlement to benefits or not coming forward for assistance;
- homes that are difficult to bring up to a sufficiently high level of energy efficiency in a cost effective manner; and
- difficulties in coordinating existing programmes that are delivering measures to households.

Work to address fuel poverty

2.1.9 In the Energy Review Report, we identified that we would take forward work to:

- get details of the help that is available to those who need it most;
- explore further ways to reduce household energy bills via energy efficiency measures;
- ensure that the energy a household consumes is competitively priced; and
- ensure households who are eligible for benefits are claiming them.

2.1.10 We have acted on each of these commitments. Through industry and the Government working together, we delivered a targeted mail out which offered energy efficiency and income assistance to 100,000 Pension Credit recipients. We are now looking to take this forward for next winter and plan to re-evaluate the offer, widen the target group and integrate this activity within our wider programme of promoting winter warmth. (See Box 2.1.1)

BOX 2.1.1 PROMOTING WINTER WARMTH

Following on from the commitment we made in the Energy Review Report an Ofgem-led Steering Group was set up, comprising of suppliers, voluntary organisations and Government representatives to work with industry to encourage households with someone aged 70 or over in receipt of Pension Credit to take up energy efficiency measures.

The big six UK energy suppliers agreed to fund a pilot mail out to 100,000 households within the target group. The aim of this pilot was to test the feasibility of the Government and industry working together, to guarantee eligibility through utilising Pension Service data and ultimately, to maximise response rates and the eventual uptake of energy efficiency measures, with a view to further roll out should it prove of value to all parties.

The mail out, which encouraged recipients to call an energy advice line so that they could be offered free insulation as well as a benefits entitlement check to help maximise their income, commenced in November 2006. The pilot generated a good rate of responses, of 6.7%, with over 3% of households receiving an energy efficiency measure or a benefit entitlement check.

As a result, all parties have since agreed to review the scope for a wider roll out of this concept, acknowledging the real results that can be obtained by working together to meet common goals tangible benefits.



2.1.11 An additional £7.5 million was announced in the Pre-Budget Report 2006 to support the development of projects which use an area-based approach to identify the needs of each household in order to provide them with a co-ordinated and tailored set of advice and measures. This will complement our already very successful fuel poverty and carbon abatement schemes for the domestic sector, namely Warm Front, the devolved fuel poverty programmes and the Energy Efficiency Commitment. It is anticipated that this funding, which is being made available in 2007/2008, will build on the experience of many existing area-based approaches, including that of Warm Zones and will ultimately assist approximately 300,000 of the most vulnerable households, community by community.

2.1.12 The introduction of new technologies is also being taken forward through the main UK fuel poverty schemes. For example, Warm Front in England has mechanisms in place for assessing alternative (usually low carbon) technologies, which can then be brought into the portfolio of measures offered by the Scheme. Alongside this, the Low Carbon Buildings Programme is hoping to attract bids from social housing providers seeking to install microgeneration in order to further demonstrate their value, particularly for low income, hard to reach properties.

2.1.13 To ensure people are aware of the assistance that is available and that it better meets their needs, we will put in place a cross-Government communications campaign in time for winter 2007/2008, so that all the help currently available, be it energy efficiency, benefits advice, tariff advice or advice on how to stay healthy in winter is coordinated and easily accessible. We will also be taking forward the lessons learnt from the recent energy supplier funded mail out to pension credit households and exploring the use of wider DWP communication opportunities, such as the annual benefit up-rating letter to pensioners.

2.1.14 We want groups with different contacts and relationships to engage and help with this work. Key partners include voluntary groups such as Help the Aged and Age Concern, the fuel poverty charities such as National Energy Action and the National Right to Fuel Campaign, the energy supply companies (who established the Home Heat Helpline), the fuel poverty scheme managers and the Energy Saving Trust.

2.1.15 It is essential that we use all means possible to target help and support at those who need it most. We will therefore take forward action enabling the sharing of benefit data in clearly specified and controlled circumstances, if necessary by using legislation.

2.1.16 Our existing schemes continue to deliver significant support to a large number of households, with over 1.5 million households having been helped to date. To ensure we are providing help in all relevant areas we will be extending benefit entitlement checks to all households requiring one who come forward to Warm Front, rather than only those ineligible at application or whose home cannot be brought up to a high level of energy efficiency.

2.1.17 The next phase of the Energy Efficiency Commitment (now re-named CERT) is currently being considered. Access to benefit data would drive down costs to locate low income households regardless of the overall size of the

Commitment and that of the Priority Group. We are also considering a flexibility option to allow suppliers to have a reduced Priority Group share if they direct some more expensive measures at those households most likely to be fuel poor.

2.1.18 The scale of the future role of alternative technologies in terms of tackling fuel poverty is currently unclear. We will therefore continue to maximise the contribution of current cost-effective energy efficiency measures across all housing stock. We will work to further encourage more activity by Local Authorities to exceed the Decent Homes Standard and promote best practice. The evidence is already that many Authorities already routinely exceed the Standard.

2.1.19 As well as the funding for local area-based initiatives announced in the recent pre-budget report, other methods of encouraging Local Authority action are also under consideration. We are currently finalising a new model that will enable each Local Authority to see the baseline fuel poverty level in their area. We will be holding a launch event shortly with subsequent local events to publicise this work and to stimulate more action to tackle fuel poverty. The Home Energy Conservation Act Review and the Local Government Performance Framework also offers scope for additional activity in this area.

2.1.20 As demonstrated by the fuel poverty statistics, it will still remain the case that for the poorest consumers, energy prices remain unaffordable. The Winter Fuel Payment continues to help some with these costs.

2.1.21 We welcome the initiatives announced by energy companies that help their vulnerable customers to cope with high prices, and continue to encourage more companies to take action in this area. We note that the scale of these offerings varies between companies and we will be working with Ofgem to evaluate each company's Corporate Social Responsibility measures to see exactly how these compare, drawing attention to the most effective initiatives and highlighting where improvements are needed. We see the provision of assistance to help their most vulnerable customers as a key part of each company's Corporate Social Responsibility programmes, and will be looking for each company to put in place a proportional programme of assistance.

2.1.22 If no further action is undertaken by companies, we will consider whether to take the opportunity for legislation to enable the Secretary of State to require companies to have an adequate programme of support for their most vulnerable customers. In this context, we may consider the role of mandated minimum standards for social tariffs in the context of the review of the policy framework. We will work closely with the suppliers in taking this forward.

2.1.23 We will also be working with Ofgem and energywatch to look at how we can encourage some of the most vulnerable customers to realise the benefits that other consumers have seen since liberalisation of the energy market by switching supplier or payment method if appropriate.



2.1.24 Chapter 2 has set out our measures regarding new types of meters and their potential to offer additional information and enable customers to make choices about their consumption. Prepayment meters already allow customers to monitor their expenditure on fuel, but are often more expensive to use. Some companies have equalised their prepayment and standard credit tariffs, but others have not, and the cost differential between direct debit and prepayment meters (used by a relatively high proportion of low income households) is increasing, standing at around £120 for a combined gas and electricity bill in 2006 compared to £84 in 2005. While we recognise that prepayment meter customers do cost more to serve, we are concerned about these increases, and will look at whether there are ways to encourage best practice in protecting the most vulnerable consumers from the large differences in bills because of the payment method they use.

2.1.25 All companies have taken some steps so that prepayment customers are not unfairly disadvantaged by tariff changes as a result of delays in updating their meters. Ofgem has been working with suppliers to address the particular problems of the updating of prepayment token meters, but we will consider ways of reducing the costs associated with pre-payment meters more generally.

2.1.26 Gas remains the cheapest heating fuel. We have developed and tested a model for delivering cost-effective gas network connections to deprived communities and regional demonstration projects are going forward in North East England and Yorkshire and Humberside. Gas connection projects undertaken on a larger scale have the scope to make a significant contribution to addressing fuel poverty. We are, therefore, discussing with Ofgem the scope for incentivising gas network extensions through the gas distribution price control, which will operate from April 2008.

2.1.27 We are midway through a full examination of our policy framework for tackling fuel poverty, looking at the ways in which each of our measures can be enhanced so that their effectiveness can be improved. It is clear we cannot rely on one single approach to eradicate fuel poverty, but will need concerted efforts across all root causes.

2.1.28 The policies and measures outlined above will take around an additional 200,000 households out of fuel poverty by 2010; however the overall package and the long-term way forward will depend on the conclusion drawn after examination of our policy framework for tackling fuel poverty. Next steps will be set out in the UK Fuel Poverty Strategy Fifth Annual Progress report in summer 2007. The report will outline action taken by the Government on a range of factors impacting the fuel poor. It will provide further analysis of our current position and outline action required to deliver on our objectives.

Fuel Poverty

Summary of measures

We will:

- take a more localised approach – in regions, Local Authorities and individual communities – to tackling fuel poverty, actively generating referrals and delivering cost effective measures;
- provide a Benefit Entitlement Check to all households that require one who come forward to Warm Front;
- enable sharing of benefit information in clearly specified and controlled circumstances, allowing help to be more easily targeted at eligible households, if necessary taking forward legislation;
- issue guidance to encourage Local Authorities to exceed the Decent Homes Standard and use the model of fuel poverty at a local level as a stimulus for action;
- put in place an cross-Government communications campaign in time for next winter, so that all the help currently available, be it energy efficiency, benefits advice, tariff advice or advice on how to stay healthy in winter is coordinated and easily accessible;
- as part of this, use DWP mailings to promote fuel poverty programmes;
- work with energy companies and others to explore a further phase of the Winter Mail Out communication enabling assistance to be directed effectively towards those who need it most;
- work with Ofgem and energywatch to encourage vulnerable customers to use the energy market to get the best deal, where appropriate;
- work with Ofgem to determine the current levels of energy company Corporate Social Responsibility Activity. We hope this will encourage companies to do more in this area. If it does not, we will look to give the Secretary of State powers to require companies to have an adequate programme of support for their most vulnerable customers. We will also be looking at whether there are ways to encourage best practice in protecting the most vulnerable consumers from the large differences in bills because of the payment method they use;
- continue to work with Ofgem on the scope for the gas distribution price control to incentivise extension of the gas network to deprived communities; and
- continue to keep this policy framework under scrutiny and report on the way forward in the next Annual Fuel Poverty Progress Report, which is to be published this summer.



CHAPTER 3

Heat and Distributed Generation

Most of the UK's electricity and more than two thirds of the UK's gas is supplied through a large nationwide grid. This centralised system has kept down costs through economies of scale and provided secure, cost-effective delivery of energy directly to our homes and businesses. As we seek to reduce the carbon emissions from the electricity and heat we use, it is increasingly clear that technological developments are opening up the possibility of a more decentralised low carbon energy system with local energy supply, ranging from household to community-scale, which could play an important part in our strategy.

3.1 Electricity and heat can be generated locally from renewable sources, making valuable carbon savings. Losses incurred in transmitting centrally-generated electricity to the point of use can be significantly reduced. The costs of transporting heat mean that many of the options for generating heat renewably have to be local. And even where fossil fuels are used, Combined Heat and Power (CHP) can, in the right setting, ensure that these fuels are used more efficiently by capturing and using heat and generating electricity in a single process. A more community-based energy system would also lead to greater individual awareness of energy and its implications for carbon emissions, driving a change in social attitudes and, in turn, greater energy efficiency⁶³. The importance of Distributed Energy (DE), and the need for further action was recognised by the Trade and Industry Committee in its recent report⁶⁴.

3.2 This chapter:

- sets out the potential benefits of more power and heat being produced locally;
- describes what the Government is already doing to realise this potential;
- sets out the work we are doing to determine a strategy for decarbonising heat;
- summarises the key proposals from the joint DTI/Ofgem Review of Distributed Generation; and
- describes how regional and local activity can help drive progress towards more locally-produced heat and power.

⁶³ Research by the Sustainable Development Commission and the National Consumer Council shows that people moving into homes with built-in renewable energy technologies report far greater awareness of what they can do to reduce their climate impact, and their energy use. Sustainable Consumption Roundtable, May 2006: *I Will If You Will* – <http://www.ncc.org.uk/responsibleconsumption/iwill-summary.pdf>

⁶⁴ House of Commons Trade and Industry Select Committee: *Local Energy – Turning Customers Into Producers* First Report of Session 2006-7.

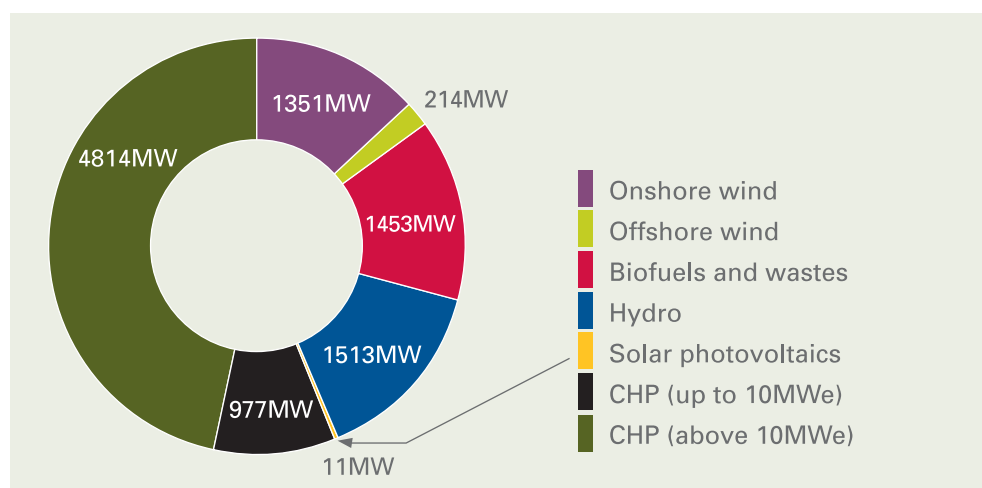
3.3 These measures will help to provide a basis on which decentralised energy can continue to grow alongside investment in the existing, predominantly centralised system.

3.4 The Devolved Administrations have various responsibilities in relation to the matters set out in this chapter. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals in this chapter which touch on devolved matters will be taken forward in accordance with the principles set out in the Memorandum of Understanding.

Distributed Energy (DE): the potential

3.5 The distributed generation of electricity and production of heat are collectively referred to as distributed energy. DE is not all low carbon. However, in this chapter we use the term DE to cover energy that is both local and low carbon. In practice this means some renewable energy, and CHP. DE currently accounts for less than 10% of UK energy supply. The Government wants to provide opportunities for DE to grow by removing barriers and putting the right incentives in place to promote DE where it proves to be cost-effective.

FIGURE 3.1 CURRENT CAPACITY OF CHP AND RENEWABLE GENERATION



Source: DTI, DUKES 2006

Note: Data is not separately collected for Distributed Generation, so this chart covers all CHP and renewable generation. In practice some of the CHP will be connected to the transmission network and some of the renewable generation (particularly wind) will generate electricity that is not used locally.

3.6 In many circumstances, heat and power sourced from DE technologies are more expensive than from the national gas and electricity networks. But, as the value of carbon is increasingly factored in to energy generation costs, and some of the DE technologies become more established, DE's relative costs are expected to improve.

3.7 We worked with WADE⁶⁵ to model the costs and benefits to the UK of a greater take-up of Distributed Generation (DG)⁶⁶ technologies over the coming twenty years. Modelling of this type is subject to considerable uncertainty.

⁶⁵ The World Alliance for Decentralized Energy.

⁶⁶ A definition of DG is provided in paragraph 3.46



It is necessary to develop possible scenarios for the likely future take-up of the different DG technologies and to project costs for each of these technologies over time. On the basis of the scenarios that we have modelled, the relative costs of DG depend upon the balance of a number of factors. On the one hand, fuel costs and carbon emissions are typically lower with an increased penetration of DG. However, CHP is an important component of any feasible DG scenario and offers only limited reductions in fuel use and carbon emissions relative to the most modern gas-fired generation. On the other hand, plant capital costs are typically lower for centralised generation. It is generally believed that transmission and distribution infrastructure costs would be lower with increased DG. However, the location-specific nature of these costs means that it has not been possible to model this effectively.

3.8 Overall our findings suggest that the costs to the UK of some DG technologies may be competitive with the costs of centralised technologies, but that overall system costs are likely to be lower if we retain a framework where DG is a complement rather than an alternative to centralised generation. However, this work is only a starting point and cannot give conclusive results about the relative costs of DG. We will carry out further analysis that incorporates the heat and electricity aspects of a decentralised energy system. Such a model is required to enable more robust conclusions about the relative costs of DG to be drawn.

3.9 The market is best placed to decide which technologies are most effective in supplying the UK's energy whilst also meeting our carbon reduction goals. It is for the Government to ensure that the opportunities for DE are opened up so that it is a viable option for the market to consider. DE is the current main option for increasing the use of renewables for heat generation.

3.10 Our policies on DE will also play a part in the UK's contribution to the EU's climate change and energy policy. In March 2007, the European Council committed the EU to a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action. The agreement commits the EU, amongst other things, to a binding target of a 20% share of renewable energies in overall EU consumption by 2020. This applies to heat and electricity, where DE has a key role to play, as well as transport. The Commission has been asked to bring forward detailed proposals for each Member State's contribution to the overall EU renewables target. After a decision has been reached, and each Member State has agreed its contribution, we will bring forward appropriate policies to deliver the UK's share.

3.11 Whilst DE has the potential to reduce carbon emissions, and help security of energy supplies by diversifying the UK's sources of energy, significant growth of DE supply would represent a considerable change from the status quo. The current market and regulatory structures have been designed primarily to meet the needs of large, transmission-connected generators. There are some technical constraints on making DE compatible with the grid, as well as planning issues and other barriers such as upfront costs, and a lack of information about the possibilities available.

TABLE 3.1: EXAMPLES OF LOW CARBON DISTRIBUTED ENERGY TECHNOLOGIES

Technology	Description	Commentary
Total DG	All generating technologies connected to distribution systems	The Energy Networks Association (ENA) reports the total generating capacity connected to distribution networks ⁶⁷ . At the end of 2006 the total was 12.7GW. However, this does include conventional generators (e.g. small Combined Cycle Gas Turbines (CCGTs) as well as renewable generation
Distributed Heat Technologies		
Solar water heating	Uses the heat of the sun to produce hot water	The DTI's Microgeneration Strategy ⁶⁸ reported almost 80,000 UK installations
Heat pumps	Uses the warmth stored in the ground or air, via a cycle similar to that used in refrigerators, to heat water for space heating	The Microgeneration Strategy reported over 500 UK installations
Biomass	Small-scale biomass installations from ~10kW to ~2MW that provide space and water heating by combustion of wood, energy crops or waste	The Microgeneration Strategy reported some 150 pellet boiler installations – likely to be a conservative figure
Distributed Electricity Generation Technologies		
Solar Photovoltaics (PV)	Panels, often roof-mounted, generate electricity from daylight (not just direct sunlight)	The Microgeneration Strategy reported some 1300 UK installations
Wind	Large wind turbines that convert wind energy directly to electricity	The BWEA ⁶⁹ reports 140 operational projects (onshore and offshore) having a total capacity of 2065MW

67 http://www.energynetworks.org/spring/engineering/pdfs/DGSG/Connection_Activity_DNOs_Dec2006.pdf

68 <http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/page27594.html>

69 <http://www.bwea.com/ukwed/index.asp>



Micro-wind (<100kW)	Small wind turbines generate electricity – can now be roof-mounted as well as attached to tall masts	It is estimated ⁷⁰ that there are over 20,000 small wind turbines with a total capacity of 7MW
Micro-hydro	Devices that capture the power of flowing water and convert it to electricity	The Microgeneration Strategy reported some 90 installations
Biomass /waste	Installations range from landfill gas generation stations to large power only facilities approaching 40MW	DUKES 2006 reports that total capacity is approaching 1400MW. See Biomass Strategy for map of installations
Combined Heat & Power Technologies		
Biomass /waste	Installations range from 100kW biomass CHP to ~ 85MWth/20MWe	See Biomass Strategy for map of installations
Micro-CHP, and CHP up to 1MWe	Small devices, usually gas-fired, that produce electricity and capture the waste heat produced as a by-product. CHP used on this scale tends to be for heat and power for a single house or on a community or commercial scale (i.e. a housing estate, or office block)	DUKES 2006 reports 1263 installations having a combined capacity of 206 MWe
CHP from 1MWe – 10MWe	CHP on this scale tends to be large community projects or small industrial applications	DUKES 2006 reports 196 installations having a combined capacity of 771 MWe
CHP over 10MWe	CHP on this scale tends to be large gas-turbine industrial applications that require a substantial heat load on a continuous basis	DUKES 2006 reports 75 installations having a combined capacity of 4814 MWe

70 By AEA Energy and Environment: see <http://www.restats.org.uk>

3.12 The DE challenge is therefore to make sure that new market opportunities are identified, that the market and regulatory environment is “user-friendly” for smaller participants, that potential barriers are identified and addressed, and that genuine market failures are resolved.

3.13 The Foresight Sustainable Energy Management and the Built Environment project, also referred to in chapter 2, will consider the long-term impacts of more decentralised ways of generating low carbon heat and electricity, and their interaction with current energy systems. This will include looking at the long-term potential and challenges of distributed generation, and its role and relationship with centralised generation. The work will examine the critical uncertainties, map possible future directions and test the policy implications, and will report in summer 2008.

3.14 There are a number of measures we can take in the short-term, as well as a range of existing policies, which will help support the take up of DE. The energy efficiency policies set out in chapter 2 will also drive investment in DE as, increasingly, take-up of the most cost-effective energy saving measures, such as insulation, will have been exhausted.

Existing and recent Government measures

3.15 Existing policies which will stimulate the take-up of DE include particularly:

- the zero carbon new homes policy;
- support for renewables, microgeneration and CHP; and
- public sector leadership.

Zero carbon new homes

3.16 The Government’s drive towards zero carbon homes will increase demand for DE. In *Building a Greener Future*⁷¹ the Government proposed that all new homes in England should be zero carbon from 2016. A firm decision on this timetable will be announced later this year. By 2016, if we meet our housing supply ambitions, there will be an additional 200,000 homes every year, the majority of which will be newly-built, zero carbon homes. This will include homes which will use DE sources of energy.

Support for renewables, microgeneration and CHP

3.17 Government has also taken a number of steps to promote some of the specific DE technologies. The proposed changes to the Renewables Obligation, set out in chapter 5, will boost support for renewable Combined Heat and Power (CHP), including the recovery of energy from waste and some types of microgeneration technologies. Defra’s Waste Strategy, published in May 2007, sets out our broader policy on improving the recovery of energy from waste, which will also boost DE.

3.18 A number of incentives are available for people looking to invest in microgeneration technologies for their home, school, community, or business. They are available under:

- Warm Front Programme (and its equivalents in the Devolved Administrations);

⁷¹ http://www.communities.gov.uk/pub/173/BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf



- Low Carbon Buildings Programme; and
- Enhanced Capital Allowance Scheme.

3.19 The Low Carbon Buildings Programme will provide £86 million of grant funding for microgeneration installations in homes, communities, public and private sectors to 2009. This includes the additional £6 million⁷² announced by the Chancellor in Budget 07 to fund householder installations only as a final tranche of funding for Phase One of the programme. Following this new funding and the high demand for the householder stream of the programme we have redesigned it – details can be found at www.lowcarbonbuildings.co.uk

3.20 Fiscal incentives are also important. A reduced VAT level of 5% is applicable to the installation of most microgeneration technologies. The list of applicable technologies was lengthened with the addition of ground-source heat pumps, air-source heat pumps and micro-CHP in the 2004 and 2005 Budgets. As announced in the December 2006 Pre-Budget Report, legislation in the Finance Bill 2007 will ensure that, where private householders install microgeneration technology in their home for the purpose of generating power for their personal use, any payments they receive from the sale of surplus power or Renewable Obligation Certificates to an energy company are not subject to income tax.

3.21 CHP benefits from a range of existing policies, including exemption from the Climate Change Levy and Business Rates. In addition, incentives for CHP have been improved by fully rewarding its carbon saving in the EU Emissions Trading Scheme (ETS) Phase II, which begins on 1 January 2008.

Public sector leadership

3.22 The public sector has a role to play in promoting DE. The Government has committed to carbon emission reduction targets⁷³ and its office estate becoming carbon-neutral by 2012. We will publish a report on ways in which local authorities can contribute to our climate change objectives, including by increasing levels of DE, by August 2007.

3.23 The Carbon Trust has allocated £10 million to Partnership for Renewables which provides support for public sector organisations wanting to invest in DE. It plans to have 500MW of renewable energy projects, primarily 3-5MW wind turbine projects, constructed or under development within the next five years by attracting private sector investment of up to half a billion pounds.⁷⁴

Heat

3.24 Decarbonising heat, by more DE and other means, is important as heat accounts for around 47% of the UK's total carbon emissions (including emissions from electrical heating) – equivalent to 71 million tonnes of carbon (MtC) in 2005.⁷⁵ Generating heat uses around half of the UK's total energy consumption by end-use. Nearly three quarters of that energy is used for

⁷² This £6 million takes the total level of funding available to householders to £18 million.

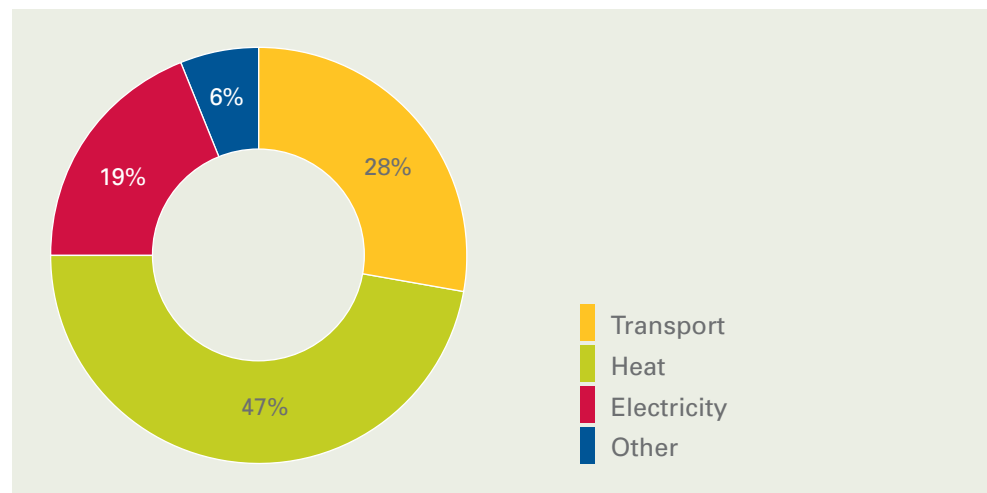
⁷³ Commitments announced in June 2006 (and repeated in the March 2006 Sustainable Procurement Action Plan) aim to reduce carbon emissions from Government offices by 30% by 2020, relative to 1999/2000 levels.

⁷⁴ www.carbontrust.co.uk/commercial/enterprises/pfr.htm

⁷⁵ UK NAEI (2005).

space and water heating, primarily in the domestic sector and to a lesser extent in the commercial and public sectors. The remainder is used by industry as an input to a wide range of processes; a small proportion is also used for cooking. The vast majority of heat demand in the domestic, commercial and public sectors is met by gas supplied through the gas distribution network;⁷⁶ industry tends to use a mix of heating fuels. Gas can be converted to useful heat at over 90% efficiency in modern condensing boilers.

FIGURE 3.3 CARBON DIOXIDE EMISSIONS BY SECTOR, 2005

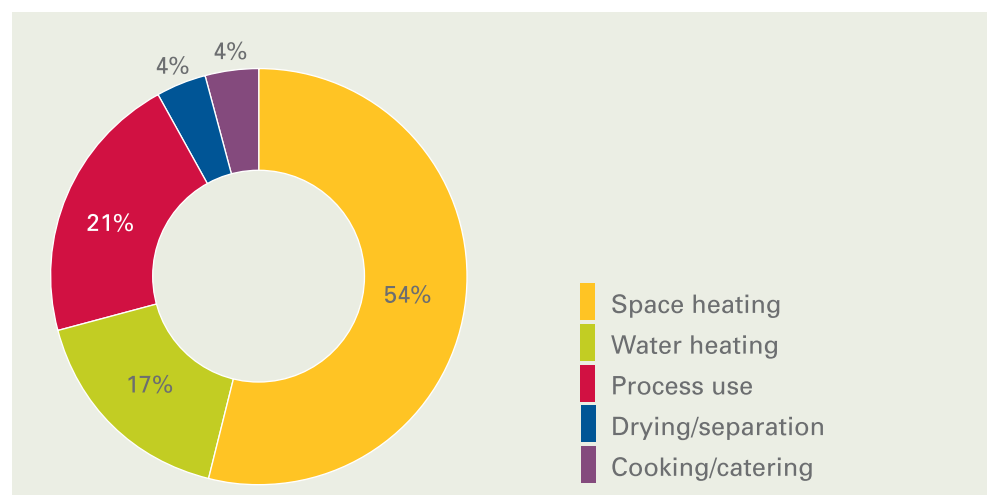


Source: Defra

Note 1: Heat emissions comprise 35% direct emissions from heat and 12% indirect emissions from electricity used to generate heat.

Note 2: other emissions include those from non-fuel combustion, agricultural and industrial emissions which do not relate to heat and electricity.

FIGURE 3.4 HOW HEAT FOR ENERGY IS USED



Source: DTI



3.25 There are three options for reducing emissions from heating:

- reduce the absolute demand for heating by improving energy efficiency. The largest and most cost-effective carbon savings in the short-term will therefore come through improved energy efficiency, supported by the energy saving measures in chapter 2;
- make more use of CHP, which is covered later in this chapter; and
- increase the proportion of heat generated through less carbon-intensive technologies (see detail below on renewable heat and biomass), including producing heat from low-carbon electricity.

3.26 DE has the potential to reduce the carbon content of both electricity and heat. However, there are some key differences between heat and electricity which dictate different policy approaches. For example:

- heat has to be produced relatively close to its point of use (in contrast with electricity which can travel great distances without substantial loss);
- renewable heat technology currently requires a distributed approach, whereas large scale renewables are already an option for reducing the carbon content of electricity;
- affordable heat is a critical part of the fuel poverty agenda; and
- electricity cannot easily be stored⁷⁷ whilst heat can.

3.27 Many current policies contribute to reducing carbon dioxide emissions from heat – for example the EU ETS, the Climate Change Levy, tax incentives for CHP and the Energy Efficiency Commitment⁷⁸ (EEC) all contribute to reduced carbon emissions from heat. In addition, policies such as the Warm Front programme to tackle fuel poverty helps to reduce emissions. However, the Government recognises the value of considering the heat sector in a holistic and focussed way and exploring the scope for further reductions in carbon emissions from this sector.

The Government will conduct further work into the policy options available to reduce the carbon impact of heat and its use in order to determine a strategy for heat. The work will look at the full range of policy options, including the range of existing policy mechanisms such as the EU ETS.

Renewable heat

3.28 Renewable heat is a potentially important means of reducing carbon emissions. The Government is committed, through the Climate Change and Sustainable Energy Act 2006, to promote the use of renewable heat. Renewable heat will also need to play its part in contributing to the UK's share of the EU renewable energy targets. Renewable heat is already competitive in some circumstances and benefits from capital grant support; it is also incentivised through EU ETS, in some cases.⁷⁹

⁷⁷ While electricity storage technologies are available, costs and technical constraints mean they are not widely used. Further developments may make storage a viable power system option in the future.

⁷⁸ The new name for EEC Phase 3 will be the Carbon Emission Reduction Target (CERT)

⁷⁹ Capital grant support for renewable heat and renewable CHP has been provided through the DTI/Big Lottery Fund Bioenergy Capital Grants Scheme and Clear Skies Initiative. There is currently support available through the Low Carbon Buildings Programme, and a new round of the Bioenergy Capital Grants Scheme, funded by Defra, has recently closed.

3.29 However, the renewable heat market has been slow to develop,⁸⁰ and currently less than 1% of UK heat demand is supplied from renewable sources. A 2005 report by Future Energy Solutions⁸¹ said that, by 2010, 1.8% of UK heat demand – rising to 5.7% by 2020 – could be produced from the range of renewable heat sources. The initial results of a draft Ernst & Young study, commissioned by DTI and Defra, indicate that renewable heat could provide significant carbon savings. They also find that various market failures exist, including the limited application and effectiveness of carbon pricing in this sector, which have slowed its development. This analysis is at a very early stage. The Government will continue to develop its thinking in this area.

3.30 The Government-appointed Biomass Taskforce, in its October 2005 report,⁸² indicated that the proportion of UK heat demand supplied from renewable sources could rise to 3% by 2010 and 7% by 2015, provided a range of barriers were addressed, including:

- the lack of a carbon price;
- low investor confidence;
- lack of awareness in the construction and supply sectors; and
- fragmented supply chains.

3.31 In its response to the Biomass Task Force, the Government committed to producing a Biomass Strategy,⁸³ which is published alongside this White Paper. It brings together current Government policies on biomass and is summarised in Box 3.1. It provides a coherent framework for the development of biomass.

BOX 3.1 SUMMARY OF THE BIOMASS STRATEGY

The strategy identifies significant potential to increase the domestic supply of biomass, through the more efficient utilisation of agricultural land, unmanaged woodland and waste. Our analysis shows a hierarchy of use in terms of cost of carbon saving, with biomass heating as the most cost efficient use for energy. The Strategy is intended to realise a major expansion in the supply and use of biomass by:

- providing targeted support in key areas such as expansion of energy crops and biomass heat installations, through direct grants and other measures such as the schools building programme;
- sourcing an additional 1 million tonnes of wood from unmanaged woodlands;
- increasing land used for production of perennial energy crops by some 350,000 hectares;
- increasing the utilisation of organic waste materials; and
- stimulating technology development.

⁸⁰ The main available renewable heat options are distributed: microgeneration (solar thermal, heat pumps) and biomass (still expensive on a small scale) for residential use, and larger biomass for commercial and industrial installations.

⁸¹ <http://www.dti.gov.uk/energy/sources/renewables/policy/renewable-heat/page15963.html>

⁸² <http://www.defra.gov.uk/farm/crops/industrial/energy/biomass-taskforce/pdf/btf-finalreport.pdf>

⁸³ <http://www.defra.gov.uk/environment/climatechange/index.htm>



Combined Heat and Power (CHP)

3.32 CHP is a potentially carbon-efficient technology which captures the heat generated as a by-product in electricity generation. Typically the process is fired by fossil fuels, though biomass CHP is growing in importance. CHP installations vary in size from micro-CHP installations, an alternative to the domestic boiler, through community schemes generating heat for housing developments and office buildings, to industrial sites equal in size to a medium-sized power station.

3.33 The carbon savings from generating electricity in CHP installations, and making use of the heat for either heating or cooling processes, depend on many site-specific factors, including the size of the scheme and the nature of its heat load. Indicative carbon efficiencies are illustrated in Table 3.2.

TABLE 3.2: CARBON SAVINGS OFFERED BY GOOD QUALITY CHP⁸⁴ RELATIVE TO THE SEPARATE PRODUCTION OF HEAT AND POWER FROM GAS⁸⁵

Size of installation	up to 1 MWe	1-50 MWe	over 50 MWe
Efficiency savings	18-30%	7-21%	10-23%

3.34 The more consistent the demand for heat throughout the day, the more economic CHP can be. Hence the best sites for CHP are industrial sites in continual operation. Community-scale projects are most effective where a range of different heat and cooling demands (residential flats, office blocks, municipal buildings) are aggregated within the system to ensure broadly constant overall demand. However, the costs of generating electricity using CHP are often higher than for standard centralised generation, even though there is a financial return for the heat that can be sold.

3.35 Therefore, in recognition of the carbon savings Good Quality CHP offers, Government has introduced a number of support measures to encourage development of such schemes, including:

- exemption from the Climate Change Levy;
- Business Rates exemption;
- full reward for the carbon saving of CHP under the allocations for EU ETS Phase II, which will inform our thinking for Phase III;
- Enhanced Capital Allowances for power stations and equipment; and
- Renewable Obligation Certificate (ROC) eligibility for the biomass element of fuel used in energy from waste plants that utilise CHP, as explained in chapter 5.

⁸⁴ Good Quality CHP denotes those schemes that meet the energy efficiency criteria prescribed by the UK's CHP Quality Assurance Programme (CHPQA). Such schemes are entitled to certain financial benefits. Further information on the programme can be found at www.chpqa.com.

⁸⁵ Source: data from the CHPQA programme on a "best available technology" basis. The range reflects the use of a range of technology types at the margins of the size boundaries and the use of alternative counterfactuals for the efficiency of a gas plant.

3.36 In addition to these measures to make CHP more financially attractive, Government has taken steps to increase awareness of the opportunities for CHP amongst users of heat. Since the publication of the Energy Review Report, DTI has published revised guidance for power station developers which includes industrial heat maps. We will work to develop those heat maps with Regional Development Agencies (RDAs) and local authorities.

3.37 Defra will work with local authorities on guidance to ensure that anyone replacing a mid-sized furnace as part of a boiler plant (over 400kW) is aware of the potential for CHP. In addition, the proposals announced here on export reward, market and licensing arrangements and connections will potentially improve the economics of CHP schemes.

Microgeneration Strategy

3.38 In March 2006, Government published the Microgeneration Strategy: *Our Energy Challenge: Power from the People*.⁸⁶ It aims to create conditions under which microgeneration becomes a viable source of energy generation for homes, communities and businesses. Actions to address the constraints on the uptake of microgeneration are summarised below.

Cost constraints

3.39 The costs of installing microgeneration technologies are relatively high. The aim of the Government's £86 million Low Carbon Buildings Programme, launched in 2006, is to demonstrate the potential of microgeneration technologies, and also stimulate the market by demonstrating their potential and providing grants to householders, public, not for profit and commercial organisations across the UK to cover installation cost. The aim of the programme is to drive up demand for microgeneration which in turn will lead to price reductions, making it more accessible across the board.

3.40 Further financial incentives include:

- rewarding the export of excess electricity, as discussed later in this chapter
- benefits associated with Renewable Obligation Certificates (ROCs), Climate Change Renewables Levy Exemption Certificates (LECs) and Renewable Energy Guarantees of Origin (REGOs). Clear guidance outlining the benefits of each and explaining how to obtain these will be published shortly. A typical domestic microgenerator would generate renewable electricity with a ROC value of around £40 at current market prices. However, as the Renewable Obligation was designed to support large-scale renewable generation, it has been difficult for householders to access this value. The changes to the Renewable Obligation introduced in April 2007, which are set out in chapter 5, are designed to remedy this.

⁸⁶ <http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/page27594.html>



Technical constraints

3.41 We are addressing a number of technical constraints to make it easier for microgenerators to connect to the grid. The smallest⁸⁷ microgenerators no longer need to obtain permission to connect to the network, and new wiring regulations will be published in January 2008 that will make it easier to connect microgenerators into existing electrical installations. DTI is working in partnership with Ofgem, energy supply companies and Distribution Network Operators (DNOs)⁸⁸ to ensure that network and market systems are able to cope with growing demand for microgeneration.

3.42 As discussed in chapter 2, smart metering is key to the overall development of the energy market and in particular allowing more sophisticated import and export tariffs to be introduced. It is important that smart meters interact intelligently with microgeneration.

Regulatory constraints/opportunities

3.43 The Microgeneration Strategy highlighted the role of Planning and Building Regulations. We are using these policies to support microgeneration. For example, the Code for Sustainable Homes was published in December 2006 along with the consultation on the move towards all new homes being zero-carbon by 2016.

3.44 We believe that the planning regime should be more supportive of microgeneration and, as a first step, we are committed to extending permitted development rights for householders which will mean that, under certain circumstances, planning permission would not be needed before installing microgeneration on a home.⁸⁹ This change will take effect in autumn 2007. Government is also considering how a similar approach could be extended to other buildings, for example, relating to agricultural and other commercial uses.

Development of the microgeneration industry

3.45 As well as addressing these constraints, the Microgeneration Strategy aims to help development of microgeneration technologies, in the following ways:

- a map of funding available for microgeneration R&D has been published on the DTI website to point companies to major funding sources in the UK⁹⁰;
- a route-map of all technologies is being developed by DTI and industry to address the specific challenges faced by each individual technology;
- DTI is working with the Sector Skills Councils to ensure the skills base develops to support the levels of demand in manufacturing, installing and maintaining microgeneration technologies;
- the Microgeneration Strategy recognises the importance of educating children in energy efficiency through their schools. Schools can access funding through the Low Carbon Buildings Programme; and
- working with industry to move away from grants-based funding to a more sustainable model.

87 The ENA's Engineering Recommendation G83/1 allows this approach for generators up to 16A/phase.

This approach applies up to a total generation capacity of around 4kW (micro-wind turbines and domestic CHP units are typically 1kW devices).

88 A DNO is an entity licensed to distribute electricity through cables and has a duty to provide connections to premises.

89 <http://www.communities.gov.uk/index.asp?id=1508888>. The Communities and Local Government consultation period closes on 27 June 2007.

90 <http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/implementation/page36314.html>

Distributed Generation (DG) Review

3.46 Beyond this range of existing measures, the Energy Review Report in July 2006 announced a joint DTI/Ofgem Review of the specific barriers to DG (including CHP). DG refers specifically to those decentralised technologies which generate electricity, and are connected to the distribution grid, as well as transmission-connected CHP⁹¹. The full DG Review Report is published separately alongside this White Paper⁹².

3.47 The UK energy market was established to meet the needs of large centralised generation. Aspects of the system disadvantage smaller players, such as distributed generators, particularly those involved in community generation projects. The system was also generally designed for one-way flow of electricity from large power stations, through the high-voltage transmission grid and into distribution networks across the country, rather than the sharing of electricity around sites within a distributed, more community-based network.

3.48 Some decentralised technologies (such as wind and solar) generate electricity intermittently, whilst CHP schemes primarily respond to the demand for heat rather than electricity. Consequently, the output of distributed generators often does not exactly match the electricity demand profile of particular consumers. As electricity cannot easily be stored, DG therefore requires the ability to both import from and export to the distribution network.

3.49 We consulted widely as part of the review. Key barriers to DG, identified by interested parties, were:

- **Cost** – DG technologies tend to have relatively high capital costs, being largely non-mass produced. The rewards for exporting excess electricity produced by distributed generators are seen as small and difficult to access. More generally, the true cost of carbon is not yet fully reflected in the price of electricity, which disadvantages lower carbon technologies.
- **Lack of reliable information** – there was a low awareness of DG options amongst potential consumers; grants and rewards such as ROCs were perceived as being hard to access; and the lack of a comprehensive accreditation scheme for suppliers and installers put people off untried technologies.
- **Electricity industry issues** – due to the nature of the existing network structure, it could be hard for small generators to connect to the centralised system, and the DNOs did not approach the connection of distributed generators in a sufficiently positive way. The cost to suppliers of rewarding small generators for exporting their excess electricity was a further disincentive to the industry.
- **Regulatory barriers** – the difficulties of getting planning permission for DG technologies was raised, especially in the context of community developments and new housing, where the associated costs and delays acted as a disincentive.

⁹¹ Most centrally-generated electricity is transported via the high-voltage transmission grid, only stepping down onto the lower voltage distribution grid to complete its journey from the power station to the customer. Transmission-connected CHP is included because the heat will be used locally.

⁹² <http://www.dti.gov.uk/energy/whitepaper>



3.50 In the context of Government's overall energy policy goals, we believe that any action to address these barriers should:

- stimulate take up of cost-effective, low-carbon forms of distributed generation;
- provide a means of enabling distributed generators to realise a reasonable economic value from their schemes;
- reduce complexity involved in setting up as a distributed generator. Requirements on these smaller players should be proportionate to their size and the use they make of the wider public network; and
- encourage, where possible, further development of DG within the licensed framework, rather than outside of it.

3.51 In light of these principles, the Government proposes a four-point package of measures as set out below.

Improving information and awareness

3.52 There is a lack of comprehensive and user-friendly information on DE. Some help (including from Government) is available to support householders, local authorities and developers to implement DE solutions, but the information is patchy or located in a variety of places. In some cases the required information does not exist.

3.53 Chapter 2 sets out the Government's strategy for getting citizens more engaged in combating climate change and advising them on how to reduce their carbon footprint. Defra launched a communications campaign in April to promote their "Act on CO₂" brand, including a CO₂ calculator. A key aim of this campaign is to encourage behaviour change and get the general public to take steps to reduce their carbon emissions.

3.54 As part of this, we intend to improve the provision of information and advice on DE, including:

- providing information about different technologies and how they work in the household, alongside the advice to households on energy efficiency set out in chapter 2;
- ensuring the availability of guidance on the potential benefits of microgeneration including how to maximise the financial benefits (grants, access to ROCs, export reward); and
- providing information for local authorities and developers on how to use DE to help achieve their emission reduction goals, including the role of planning policy, information on specific technologies, the role of Energy Service Companies and other financing options. We are considering how we could improve the advice and support available to the Core Cities and Local Authorities to help them deliver key opportunities for carbon abatement, including DE and innovative programmes of support for householders. DTI, Defra and CLG will jointly publish a report by August 2007 to help local authorities⁹³ meet our climate change objectives including by increasing levels of microgeneration and DE.

⁹³ Local authorities in England and Wales will be under a statutory duty to have regard to this report in exercising their functions.

3.55 In addition to the provision of information we will improve confidence by introducing a microgeneration certification scheme covering products, installers and manufacturers. This will provide consumers with independent certification of microgeneration products and services, and a route for complaints. A pilot scheme⁹⁴ covering product installation, and a Code of Practice, opened for the transition phase in May 2007, building on the existing Clear Skies and Solar PV accreditation schemes. It will be supported by DTI initially, with the objective of the industry taking the responsibility for it in due course.

We will ensure that this improved information on DE provides a comprehensive picture of all the options, costs and benefits to help accelerate the take up of DE. We will keep under review the need for further measures.

More flexible market and licensing arrangements

3.56 Licences are required for the generation, distribution and supply of electricity,⁹⁵ though in some circumstances exemptions are applicable⁹⁶. Licensed parties have to comply with a range of licence conditions to ensure, amongst other things, the safe distribution and supply of electricity, and to provide consumer protection. Licences also require the licensee to be a party to relevant industry codes, which are technically complex and therefore require significant expert resource to understand and comply with; the kind of resource that the smaller distributed generators do not have.

3.57 The wholesale electricity market was established around a centralised model. Therefore, the complexities and associated costs facing small generators in fully participating in this market, and the obligations that suppliers have to meet to trade across public networks, are significant discouragements to DG. Those that have established DG schemes have reported that success has come from finding solutions in spite of the system, rather than because of it.

3.58 For example, the Woking Borough Council DG scheme uses a private network, making full use of the licensing exemptions framework, to avoid the costs and complexities. Exemptions take enforcement of issues related to consumer choice, protection and safety largely outside of the remit of the regulator; on a small scale this has minimal impact on the market. However, in the future, as we hope to move towards increased levels of DG across the country, Government is committed to improving the market opportunities so that DG can flourish inside the licensed framework.

94 <http://www.ukmicrogeneration.org.uk>

95 Apart from transmission connected CHP schemes, for the majority of DG schemes transmission licences are not applicable.

96 The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 provides for those that generate, distribute or supply specified, smaller amounts of electricity to remain exempt from the need to be licensed. Most DG schemes fall inside the exemption limits for generation. Such an unlicensed generator who supplies up to 5MW in aggregate, of which no more than 2.5MW is supplied to domestic consumers, can supply electricity across public networks, therefore making use of both the generation and supply exemptions framework.



3.59 Ofgem has proposed fundamental simplifications to the existing supply licence, and implementation of the modified licence is planned for June 2007 this year. It will contain half the number of standard conditions and will set out simpler, clearer obligations. It will retain only those obligations necessary for the energy market to function properly and to protect the interests of customers, especially those who are vulnerable. However, there is a requirement for a broader review of industry arrangements, including those relating to energy trading, to facilitate DG.

To address these barriers DTI and Ofgem will consult later in 2007 on options for more flexible market and licensing arrangements for distributed low-carbon electricity within the licensed framework, to be implemented by the end of 2008.

3.60 One important future model for delivering DG is the Energy Services Company (ESCO). The Government will be taking forward further work to examine the potential role of ESCOs and ways in which we can support their development. Box 3.2 explains the concept and summarises current government action in this area.

BOX 3.2 ENERGY SERVICE COMPANIES (ESCOS)

An ESCo is a company that provides a customer with energy supply solutions (such as heating and lighting) rather than simply gas and electricity. An ESCo could provide a customer with a combination of energy-saving advice and equipment, renewable generation, planned maintenance, fuel and finance. Government recognises that ESCOs offer a useful model for market delivery of its energy objectives, as they can bring together different areas of expertise, skills and investment to facilitate the cost-effective development and implementation of distributed energy systems.

Government's role in providing the framework to enable ESCOs to develop involves:

- providing the right incentives through the development of efficient energy and carbon markets;
- removing barriers, such as addressing poor quality information on energy consumption through improved billing and metering. Ofgem has proposed the removal of the 28-day rule as part of its Supply Licence Review, and this has already been subject to extensive consultation. This Review will enable suppliers and consumers to reach longer-term agreements and facilitate the energy services approach;
- addressing lack of awareness and expertise by providing information and encouraging the sharing of experience among public sector, utility, corporate and financial stakeholders;
- overcoming risk and uncertainty by setting a standard framework for processes (such as contracts) and facilitating accreditation; and

BOX 3.2 continued

- ensuring competitive market conditions by making it easier for new market entrants while maintaining service standards.

Following the commitment in the Local Government White Paper, we will continue to work with the Core Cities to identify opportunities for low-carbon energy services, where developing a relationship with an ESCo could lead to better delivery of carbon emissions reduction. We will also work with the British Council of Shopping Centres to take forward the option of DG in new shopping centre developments.

Clearer export rewards for smaller generators

3.61 Many distributed generators produce more electricity than they need. This excess electricity can be sold ("exported") to suppliers in order to earn some extra income for the generator and supply a small amount of electricity to the system.

3.62 Suppliers are not currently required to make an offer for exported electricity. Most suppliers do now offer tariffs, but few of these tariffs are widely advertised and the terms vary considerably between suppliers. This makes it difficult for customers to determine which tariff will best meet their circumstances.

3.63 The tariffs available generally offer a lower price for exported electricity than the retail price for imported electricity. This reflects the expected difference between wholesale and retail price in any market, including the cost of transporting the exported electricity to a customer and the transaction costs for the supplier. In many situations where traded volumes are small it is, in fact, uneconomic (at present) for suppliers to purchase this electricity.

3.64 Transparency of prices offered by each supplier for exported electricity in a simple and easy to understand format is the first step to addressing this barrier.

All six major energy suppliers have now committed to publishing easily accessible export tariffs.

3.65 There are a number of technical changes that would help suppliers to cut their administration costs, thus making it more cost-effective to offer a tariff for exported electricity. We welcome the engagement of industry thus far on these changes, and will continue to work with them to progress this work.



3.66 We will keep under review whether it is necessary to use the powers granted under The Climate Change and Sustainable Energy Act 2006,⁹⁷ which allows Government, from August 2007, to vary supply licences to require suppliers to offer to acquire electricity exported by their customers. Our decision will be informed by Ofgem's work, announced in Budget 2007, to examine how green homes could benefit more from prices paid for electricity exported to the network, and how the market for rewarding microgenerators develops.

Facilitating connections for distributed generators

3.67 Distributed generators can range in size from a few KW to 100 MW or sometimes more. The smallest microgenerators no longer need permission from a DNO to connect to the distribution network – they can simply connect and inform the DNO that they have done so⁹⁸. Generators above this limit, however, need to go through a more onerous process and several responses to the DG Call for Evidence⁹⁹ suggest that DNOs could make the connection process quicker and easier for their customers. In line with the Government's desire for DG to compete on a level playing field with conventional generation, the Government believes that it is important that distributed generators can connect to the grid easily and efficiently.

3.68 There is no evidence of fundamental technical barriers to connection for DG¹⁰⁰. Instead the process for connection needs to be simplified for DG to make it more accessible and cost-effective. We recognise the significant progress that has been made in addressing barriers, much of it through the Energy Networks Strategy Group (ENSG) co-chaired by DTI and Ofgem.

3.69 However, more is needed to ensure that DG can play its full part. The Government welcomes Ofgem's initiatives to:

- extend cost-reflective charging to the distribution network. This benefits local generation because it potentially allows credits to generators where they provide benefits to the network;
- extend its Innovation Funding Incentive to the end of the next price review period (likely to be 2015) and to extend eligibility for Registered Power Zones to generation connected in the next five years;
- allow developers of DG a choice of connection provider
- review during 2008, as part of the next price control review, the incentives and investment drivers for DNOs to connect DG; and
- review how the DNOs' Long-Term Development Statements can be made more useful to distributed generators.

3.70 More broadly, it will be important for network operators to invest in the light of these longer-term developments. We have funded work on long-term scenarios through the ENSG and we welcome Ofgem's plans to undertake long-term analysis (see chapter 5). Taken together, these connections

97 Sections 7 and 8, Climate Change and Sustainable Energy Act 2006:
<http://www.publications.parliament.uk/pa/cm200506/cmbills/017/2006017.pdf>

98 See footnote 87

99 <http://www.dti.gov.uk/energyreview/implementation/distributed-energy/page35076.html>

100 <http://www.dti.gov.uk/files/file31648.pdf>: Econnect carried out a study of the network reinforcement costs for increasing DG penetration. It found that almost 20% penetration of microgeneration could be accommodated without network reinforcement, but that for larger DG power stations, average reinforcement costs will rise from current levels. More details are in the DG Review Report.

measures should better facilitate the connection of DG to distribution networks. This will increase incentives for DG and increase the possibility for DG to compete alongside centralised generation to supply GB's electricity needs.

3.71 The Ofgem-chaired Transmission Arrangements for Distributed Generation Group (TADG) is currently considering the interaction between DG and the transmission system, and plans to report its findings later this month. Many respondents to the Call for Evidence were concerned that this work could be detrimental to DG, by eroding the "embedded benefits" that reward DG for the network benefit it brings. The Government would not want to see additional barriers erected to DG. However, charges should be cost-reflective, with charges being proportionate to the costs imposed, and with parties appropriately rewarded for any benefit contributed. In general, the Government believes that the burden of regulation on a distributed generator should be proportionate to its use of the network.

Driving demand for DE at local and regional level

3.72 Local authorities and regions have a key role to play in facilitating the development and uptake of DE – as community leaders, through their knowledge of local opportunities, and through their powers and responsibilities for planning and regeneration. Some local authorities and regions are already at the cutting edge of efforts to develop DE schemes in the UK. Government has taken steps to support this drive for low carbon energy generated locally, particularly in its planning and development policy. Government has made it clear that it expects all planning authorities to make full use of the positive approach to renewables set out in Planning Policy Statement 22 on Renewable Energy.

3.73 Chapter 2 sets out the additional measures that the Government is taking to improve energy efficiency and reduce the carbon footprint of the built environment. The Government's ambition is that all new housing development in England should, by 2016, be zero carbon, and has consulted on a timetable for moving towards that standard¹⁰¹. The measures to support the move towards zero carbon homes and development, and thereby stimulate demand for DE include in particular:

- the draft Planning Policy Statement: Planning and Climate Change which expects planning to be a positive force for change by helping to create an attractive environment for innovation and for the private sector to bring forward investment in renewable and low carbon technologies;
- measures to improve the energy performance of Building Regulations so that over time all new homes meet the energy and carbon standards set out in the Code for Sustainable Homes;
- time-limited stamp duty exemption for new zero carbon homes¹⁰²; and

¹⁰¹ [http://www.communities.gov.uk/pub/173/](http://www.communities.gov.uk/pub/173/BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf)

[BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf](http://www.communities.gov.uk/pub/173/BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf)

¹⁰² From 1 October 2007, all new zero-carbon homes costing up to £500,000 will pay no stamp duty, with zero-carbon homes costing in excess of £500,000 receiving a reduction in their stamp duty bill of £15,000. The exemption will be time-limited for 5 years until September 2012, with the Government considering the case for an extension before then. For further details see Budget Note 26 in http://www.hm-treasury.gov.uk/media/757/0A/bud07_budgetnotes_381.pdf



- low to zero-carbon demonstration projects – notably the Carbon Challenge and the Thames Gateway study. In the Thames Gateway, CLG will be supporting the development of decentralised energy projects in specific locations such as Barking, and by working with English Partnerships to develop a portfolio of energy projects that a future ESCo could take forward.

3.74 The English Regions, particularly through the RDAs with their role in supporting sustainable economic development, regeneration and innovation, will play an important role in identifying and securing opportunities for distributed energy. As well as their role in helping developers identify potential customers for heat, RDAs will act to support innovative energy financing and delivery models in their regions. RDAs will also support the development of DE projects (such as anaerobic digestion plants) for example, by supporting the development of energy supply chains and skills, and by ensuring regeneration projects meet high standards of carbon efficiency. This is covered in more detail in chapter 9.

Next steps

3.75 The measures in this chapter should substantially improve the environment for DE in the UK. The measures to promote lower carbon developments will drive demand for decentralised heat and electricity generation. Meanwhile, a number of barriers to DE projects are being removed, making DE a more realistic alternative to the traditional, centralised approach.

3.76 It is for the market to decide on the best mix of technologies but we are committed to ensuring that DE solutions have a real opportunity to compete. We are establishing a new Distributed Energy Unit within the DTI to monitor the development of markets for these technologies, to drive the implementation of these measures and to ensure that any further barriers to DE that may be identified are addressed. Our further work will take account of the impact of these measures and proposals for implementing the EU renewables target, as they are developed over the next few years.

Distributed Energy Summary of Measures

- to remove barriers and encourage more widespread deployment of distributed generation we are bringing forward a package of measures, including:
 - information, and guidance on options in distributed generation;
 - more flexible market and licensing arrangements for distributed, low-carbon electricity supply, within the licensed framework, to be implemented by end 2008;
 - more clarity on the terms offered by energy suppliers to reward micro-generators for the excess electricity they produce and export; and
 - making it easier to connect to and use the distribution network.
- these measures will support the drive for distributed energy from the Government's move to zero carbon homes;
- we are conducting further work into policy options to reduce the carbon impact of heat, including reviewing the impact of the range of existing mechanisms;
- we are publishing the UK Biomass Strategy to maximise the supply and use of biomass – wood, energy crops, waste, and more – in the production of sustainable energy; and
- we are continuing to take forward implementation of the Microgeneration Strategy, announced last year, including making it easier to get planning permission and providing funding to help meet the costs of installation.



CHAPTER 4

Oil, Gas and Coal

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

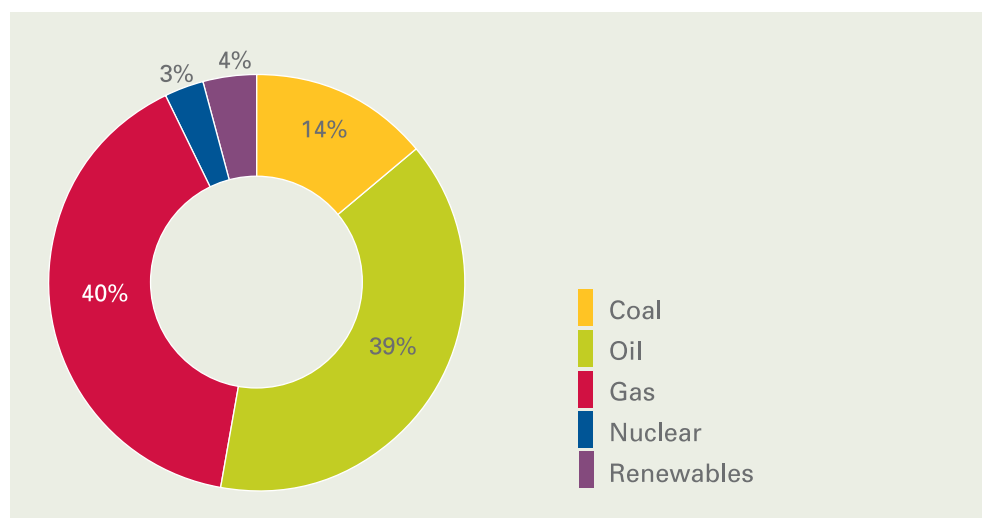
4.01 This chapter:

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

Current UK energy market outlook

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

FIGURE 4.1 PRIMARY ENERGY DEMAND BY FUELS (2020)¹⁰³



Source: DTI, 2007

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

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

BOX 4.1 DRIVERS OF SECURITY OF SUPPLY

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

Security of energy supplies requires sufficient, diverse and reliable:

- supplies of energy to meet customers' demand;
- capacity on the import, transmission and distribution networks to deliver supplies to customers.

In turn, ensuring these conditions are met requires:

- sufficient investment globally in production, storage and transportation of fuels;

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



BOX 4.1 continued

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

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

Our strategy to manage energy security of supply risks

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

4.06 Our starting point for addressing these risks must be to reduce our overall energy use through greater energy efficiency. The measures to achieve this are set out in chapter 2. Beyond that we must also support the development and deployment within the UK of non fossil fuel energy to reduce our dependence on fossil fuels and to diversify the range of energy sources available to the UK¹⁰⁴. This includes renewables and, subject to the consultation being launched with this White Paper, new nuclear power. At the same time, as we will continue to rely on fossil fuels for the foreseeable future, we need to encourage the adoption of low-carbon technologies, such as carbon capture and storage, to mitigate the impact on the climate of the continued use of fossil-fuels. Measures to achieve these are set out in chapter 5.

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

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

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

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

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

4.10 Given the particular risks associated with our increasing reliance on gas, and since it is through pipelines in other EU Member States that our companies need to get much of the gas they need, we will push for the completion of the EU energy market liberalisation. In addition, we will continue to promote efficient, open and transparent energy markets abroad to ensure fair access to gas infrastructure. We have consulted on the robustness of our gas market framework and are publishing our response alongside this White Paper. The consultation was published on 16 October 2006 and concluded on 12 January 2007¹⁰⁵. We will also propose to legislate and reform the planning and licensing system to ensure timely investment in storage and new import infrastructure and take steps to improve our emergency planning arrangements.

Encouraging energy efficiency and non fossil fuel energy

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

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

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

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



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

Maximising economic recovery of fossil fuels in the UK

Oil and gas

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

BOX 4.2 OUTLOOK FOR UKCS OIL AND GAS PRODUCTION

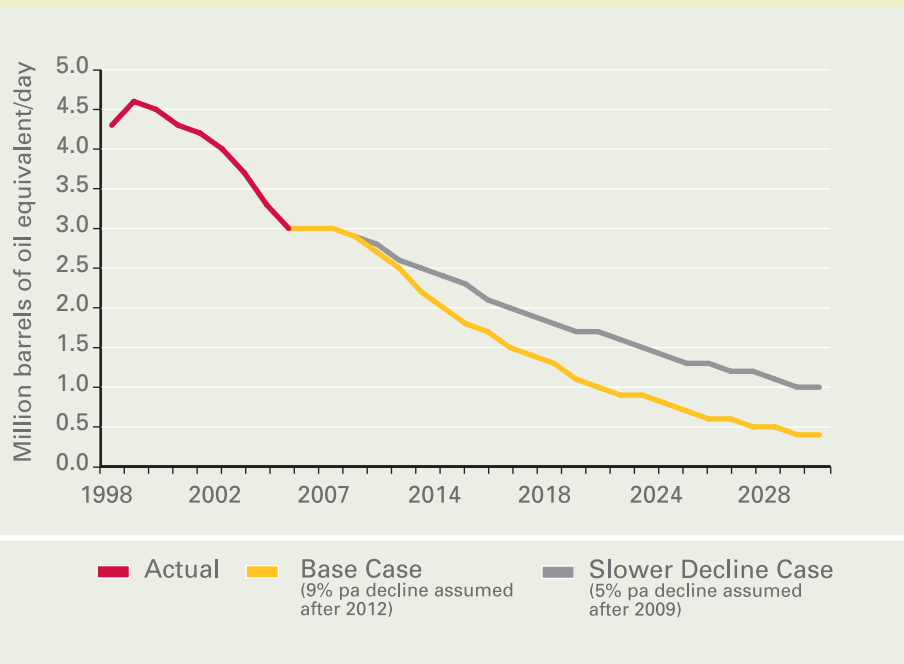


FIGURE 4.2 ACTUAL AND POSSIBLE FUTURE UKCS OIL AND GAS PRODUCTION

Source: DTI, 2007

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

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

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

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

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

4.19 The Government also recognises that the North Sea fiscal regime has an important role to play in delivering the best possible future for the UKCS through promoting investment and production, whilst ensuring a fair return for the UK taxpayer from our national resources. Since the 2005 Pre-Budget Report the Government has been engaged in discussions with industry on wider structural concerns over areas of the North Sea fiscal regime. A discussion paper was published alongside the Budget 2007 that summarised these discussions and set out the Government’s initial conclusions, and the criteria that any changes to the regime should meet¹⁰⁶. The conclusions included a statement that will alleviate existing industry concerns by clarifying that Government is not attracted to any mechanism that would remove Petroleum Revenue Tax and then rebalance the fiscal regime through an increase in the Supplementary Charge. The discussion paper will now form the basis for further, more focused, discussions with industry over the coming months that will assist Government in its consideration of the issues raised and possible options for further action.

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



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

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

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

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

Coal

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

4.26 Generators have already committed significant investment to enable 20 gigawatts of existing coal-fired power stations to comply with new EU emissions legislation¹⁰⁷. Plans for new coal-fired power stations have also been

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

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

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

4.28 Following the publication of the Energy Review Report the Government convened a Coal Forum. This brings together coal producers, generators, unions and equipment manufacturers and the Government to examine the opportunities and challenges facing coal in the UK, to bring forward ways of strengthening the industry, and working to ensure that the UK has the right framework to secure the long-term future of coal-fired power generation; optimise the use of our coal reserves, where recovery is economic; and stimulate investment in clean coal technologies¹⁰⁸.

BOX 4.3 UK COAL PRODUCTION

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

Table 4.1 Coal production and demand – Million tonnes

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

Source: DTI, *Energy Trends March 2007*

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



4.29 The Coal Forum does not discuss commercial matters, though the Forum has acted as a catalyst for meetings between producers and generators outside the Forum, which have generated a wider appreciation of the long-term investment needs of mine operators. The Coal Forum will publish an interim overview report in summer 2007¹⁰⁹.

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

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

Ensuring effective energy markets

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

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

Energy security of supply information

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

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

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

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

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

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

Meeting the challenge of increased import dependence

Oil market

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



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

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

BOX 4.4 REVIEW OF OIL REFINING CAPACITY

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

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

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

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

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

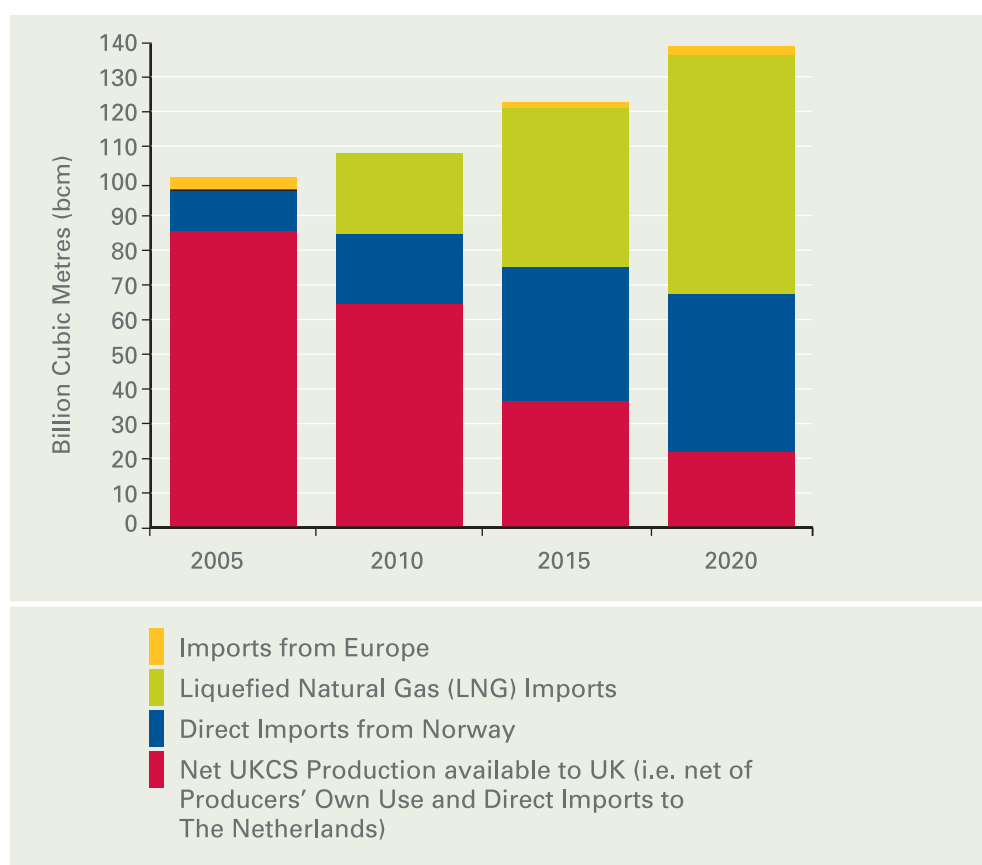
4.42 The Government has also established with industry an Aviation Fuel Task Group. It will analyse future jet fuel demand at Heathrow and other UK airports up to 2030 and what fuel supply infrastructure may be needed to meet demand. We will also look at the infrastructure needed for other oil products.

Gas market

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

4.44 By 2010, imports could be meeting up to a third or more of the UK's total gas demand, potentially rising to around 80% by 2020. In the medium term, limited liquidity in the market and shipping distances mean that gas will still be largely supplied regionally through pipelines. Norway will remain a key supplier and is expected to provide up to around a third of our supplies by 2020. Other supplies will come from continental Europe, and from the development of the Liquefied Natural Gas (LNG) market¹¹⁰. Overall, as a result of this increase in imports, we will benefit from greater diversity of supply, but be more exposed to the risk and impact of any overseas disruptions to energy supplies as supply routes become longer and across more countries. Figure 4.3 shows a possible scenario for the future gas supply mix to the UK, including supplies from Norway, LNG and continental Europe¹¹¹.

FIGURE 4.3 POSSIBLE SCENARIOS FOR UK ANNUAL GAS SUPPLY MIX



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

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



4.45 Worldwide LNG supplies and import capacity are expected to double by 2010¹¹². This means LNG will play an increasingly important part in the gas supply mix for both the UK and Europe, and could play a particularly important role in creating a global market for gas by linking the two largest consuming regions: Europe and North America. LNG can also enable gas importing countries to have more diverse gas supplies and import routes, thereby potentially increasing security of supply and competition.

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

BOX 4.5 GAS MARKET FRAMEWORK

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

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

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

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

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

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

BOX 4.5 continued

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

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

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

4.49 Storage capacity available in Great Britain is also set to increase substantially. If all the planned storage projects go ahead the proportion of peak day demand that could be met by storage operating at its maximum level would increase from 24% in 2006/07 to between 40% and 60% by 2015/16¹¹³. Our current forecasts of gas demand also imply that, depending on the severity of the winter, we will need to increase our import capacity by 2020 by an extra 12bcm to 24bcm – equivalent to 15%-30% of 2006/07 import capacity¹¹⁴. Plans are already in train to deliver some of this investment.

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

¹¹³ Peak day demand here is assumed to be "1 in 20 winter" demand.

¹¹⁴ This figure implies capacity is not fully utilised – source Oxera, *An assessment of the potential measures to improve gas security of supply*, 2007



recently consulted on security of supply arrangements in the gas market¹¹⁵. The consultation looked at the effectiveness of current gas security of supply arrangements and at possible options to improve market functioning.

4.51 Alongside the consultation we commissioned further analysis of the potential risks to security of supply in the medium term and to quantify the costs and benefits of the options considered in the consultation¹¹⁶. Fuller details of the responses and the analysis can be found in the Government response to this consultation published alongside this document.

4.52 Many respondents to the consultation as well as the analytical work carried out for this Energy White Paper indicated that the current framework, although effective, does not eliminate all the risks to security of supply. The analysis illustrated that the probability of gas supply interruptions was very low until the middle of the next decade¹¹⁷. After that, modelling shows that the risk of supply interruptions increases, but overall the probability and the average size of possible interruptions is low (the expected annual supply shortfall is significantly less than 1% of demand).

4.53 However, both the consultation responses and analysis highlighted that none of the options considered in the consultation are without downsides and could potentially hinder rather than improve security of supply¹¹⁸. The responses and analytical results indicated that:

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

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

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

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

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

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

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

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

Improvement to the effectiveness of the gas market

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

4.57 It is not possible, however, to eliminate all risks of gas supply shortfalls. In this context, the European Commission, in its Strategic Energy Review, considered the need for effective mechanisms to be put into place to ensure flexibility in the event of an energy crisis – in particular the role of strategic gas stocks in providing security of supply. In the Energy Review Report, the Government has already considered and rejected the case for domestic strategic gas storage¹¹⁹. We continue to believe that the key to security of supply lies with a regulatory framework that incentivises commercial storage and with liberalisation of the gas market in Europe. However we look forward to seeing a robust cost-benefit analysis from the Commission on the issue of strategic stocks, including a robust assessment of how to mitigate some of the potentially serious unintended consequences of administered “strategic” gas storage (e.g. the displacement of investment in commercial storage and market flexibility).

Changes to the Planning and Licensing regime

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

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



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

4.59 Last year the Secretary of State announced measures to review the current regulatory framework in the UK for gas supply infrastructure onshore and offshore. The Government is consulting on proposals to address this need for simplification of the onshore gas planning regime as part of the planning White Paper 2007, *Planning for a Sustainable Future*. This sets out proposals for the new planning system and consults on rationalising the regime for nationally significant gas supply infrastructure projects in England to bring all decision making under the proposed independent infrastructure planning commission¹²⁰. More detail on measures to improve planning matters related to streamlining of onshore gas consents regimes can be found in chapter 8.

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

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

4.62 The Government response to the consultation is published alongside this White Paper¹²¹. To summarise, respondents were generally extremely supportive of proposals to explicitly provide for these new offshore developments in legislation. New legislation would provide a simpler consents procedure, involving two determining authorities – the Crown Estate, who would issue geographically bound authorisations for the use of the sea-bed or water column, and the DTI, who would issue a Gas Storage Licence for offshore gas storage, or an LNG unloading licence as appropriate. Because offshore gas storage and pipeline developments may often be associated with offshore petroleum developments, for which the DTI is the regulator, it is appropriate to build in this way on the existing arrangements. Gas storage in partially depleted oil and gas fields would still require a Petroleum Production Licence.

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

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

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

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

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

BOX 4.6 GAS QUALITY ISSUES

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

Changes to ensure robust emergency planning arrangements

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

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



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

Impact of our proposals

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

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

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

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

Oil, gas and coal

Summary of Measures

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

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



Electricity Generation

Section 5.1 – Investment Framework

Over the next two decades, the UK will need substantial investment in new electricity generation capacity to replace a number of closing coal, oil and nuclear power stations and to meet expected increases in electricity demand. We want to ensure we have an investment framework which encourages investment to come forward at the right time and as much as possible in low carbon forms of generation.

5.1.1 This section sets out:

- the current framework within which the electricity market functions;
- the challenges for the future given the need for substantial new investment over the next two decades; and
- our analysis of various future scenarios which may influence companies' investment decisions and our policy conclusions based on the results of this analysis.

5.1.2 There are many uncertainties about the future and we cannot know today which mix of electricity generation technologies will be the most appropriate for delivering our energy policy goals over the medium to long-term. We believe that a market based approach is the best way to manage these uncertainties, providing the flexibility to be responsive to developments we cannot yet know. Operating within this framework, market participants are best placed to manage the complex range of interrelated factors affecting the profitability of electricity generation investments and how these might evolve over time.

5.1.3 When markets work well, prices reflect the true costs to companies of generating electricity and the value consumers attach to buying electricity. For instance, electricity price rises over and above generation costs would lead to investment in new electricity generation capacity, as firms see that there are returns to be made. At the same time, price rises also encourage consumers to be more energy efficient.

5.1.4 The effective functioning of Great Britain's electricity market is overseen by an independent regulator, the Office of Gas and Electricity Markets (Ofgem). Ofgem's responsibilities for ensuring competition and enforcing regulation are a key contribution to achieving our energy goals. In Northern Ireland, similar responsibilities are carried out by the Office for the Regulation of Electricity and Gas (OFREG). Promoting competition in energy markets incentivises companies to operate more efficiently and manage their investment risks effectively, placing downward pressure on prices and increasing service quality (see Box 5.5.1).

5.1.5 To date, the UK has benefited from one of the most competitive and reliable electricity markets in Europe with "cost-reflective" prices and few outages. Where outages have occurred, these have been the result of short-term network failures rather than shortages of electricity generation capacity.

BOX 5.1.1 RESPONSIBILITIES OF OFGEM

Ofgem holds key responsibilities which both directly and indirectly contribute to security of energy supply. These include: regulating the natural monopoly networks in gas distribution and electricity transmission by the issuing and modifying of licences; investigating and penalising licencees who breach their licence conditions; and setting price controls.

Ofgem's duties in relation to ensuring competition include protecting consumers' interests, ensuring that markets are as free of distortions as possible and that price signals are accurate and reliable, hence helping new investment.

The regulator also has a key responsibility for ensuring that adequate, timely investment in the transmission network infrastructure occurs. Such investment is important not just to replace old network equipment but also to enable connections to the grid of new electricity generation such as that from renewables.

Additionally, Ofgem regulates the operator of the national transmission system, National Grid, via a set of licence conditions that require National Grid to maintain a balanced system. These features of the regulatory framework contribute to delivering electricity supplies via a network that Ofgem analysis showed to be 99.99% reliable in 2005.

Ofgem also has a statutory duty to contribute to the achievement of sustainable development, consistent with its role as an independent economic regulator. The Government considers this duty an essential element of Ofgem's remit and attaches great importance to Ofgem making an effective contribution towards this objective.



5.1.6 However, in recognition that the market alone will not deliver the Government's wider social and environmental goals, our policy framework also provides incentives to ensure that firms take account of the emissions they produce and the environmental impact of those emissions.

5.1.7 With the introduction of the EU Emissions Trading Scheme (ETS) in 2005, power station operators now face a cost for emitting carbon dioxide. By requiring firms to take account of the cost of carbon emissions in their decision making, the EU ETS incentivises investment decisions that reflect our carbon objectives. We recognise the importance of a clear and stable carbon policy framework in creating the confidence and certainty necessary to underpin long-term changes in firms' behaviour, investment and use of energy. This is especially important for investments in long-lived assets (such as power stations) which will have an impact on the UK's carbon emissions for several decades.

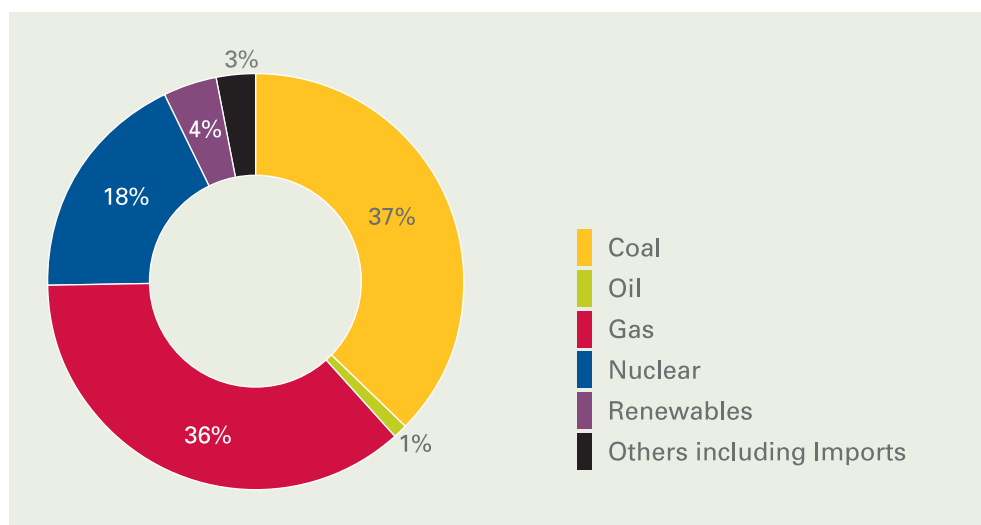
Current UK electricity generation mix and challenges ahead

5.1.8 The UK currently has around 76GW (gigawatts) of electricity generation capacity to meet annual consumption of about 350TWh (terawatt hours) and winter peak demand of about 63GW. This level of capacity is roughly 20% higher than the expected level of peak demand¹²². The composition of the UK's existing generation fleet is largely a result of the considerable number of new gas-fired power stations built during the second half of the 1990s – known as the “dash for gas” – when the economics of new gas power stations were particularly compelling. Consequently, few new power stations have been built during the early to mid-2000s. During this time consumers have benefited from lower electricity prices, driven by the increased competition in electricity generation and due to the excess of generation capacity.

5.1.9 The UK also has a diverse electricity generation mix. In 2006, 36% was generated by gas-fired power stations, 37% from coal, 18% from nuclear, and 4% from renewables. The remainder comes from other sources such as oil-fired power stations and electricity imports from the continent (see Figure 5.1). This diverse generation mix avoids exposure to the risks associated with heavy dependency on a single fuel or technology type, helping to maintain secure supplies of electricity. A diverse mix in electricity generation also provides the system with the flexibility to accommodate variations in demand at different times of the day (i.e. at peak vs non-peak times), or year (i.e. in winter vs. summer), and in response to changes in fossil fuel prices.

¹²² National Grid 2006 GB Seven Year Statement puts the plant margin (capacity over and above winter peak demand) in 2006/7 at 22.6%.

FIGURE 5.1.1 2006 UK ELECTRICITY GENERATION MIX



Source: DTI, 2007

BOX 5.1.2 EU ENVIRONMENTAL LEGISLATION

Most of the UK's power station closures over the next decade are being driven by EU environmental legislation aimed at reducing sulphur dioxide and nitrogen oxide emissions.

The Large Combustion Plant Directive (LCPD) imposes two separate constraints on coal and oil stations. One requires that about 11GW of "opted-out" coal and oil stations close by end 2015 and the second restricts the operation post-2016, of around 20GW of coal stations that "opted-in" to meet the requirements of the LCPD. The extent to which the operation of power stations is affected by this second constraint depends on how much further investment firms decide to make in their power stations between now and 2016 to comply with reduced limits for nitrogen oxide emissions.

5.1.10 The current generation mix means that the UK's electricity generation sector accounts for about one third of the UK's total carbon emissions or 47 MtC per year. The sector has made some progress in decarbonising since 1990, largely as a result of the increased share of gas-fired generation in the mix.

5.1.11 Over the next two decades, the UK will need substantial investment in new generation capacity to replace the closing coal, oil and nuclear power stations, and to meet expected increases in electricity demand. Our analysis shows that 22.5GW of existing power stations may close by 2020¹²³. Of this, 8.5GW of coal-fired capacity will close to meet the requirements of the EU

¹²³ Redpoint Energy, *Dynamics of GB Electricity Generation Investment: Prices, Security of Supply, CO₂ Emissions and Policy Options*, 2007



Large Combustion Plant Directive (LCPD) by end 2015; as will about 2.5GW of oil power stations (see Box 5.1.2). Around 7GW of nuclear power stations are also scheduled to close between now and 2020, on the basis of their currently published lifetimes.

5.1.12 If we are to maintain levels of electricity generation capacity equivalent to those available today, then new power stations need to be built in good time to replace these closures and to meet increases in demand. On this basis, around 20-25GW of new power stations will be needed by 2020.

5.1.13 Further investment is likely to be needed in subsequent years as further power station closures take place and to meet further increases in demand. Our modelling suggests that up to an additional 10GW of electricity generation capacity may be needed by 2030. The indicative investment plans, as reported by power companies to National Grid, reveal that transmission capacity contracts exist for around 25GW of new electricity generation plant over the next seven years (although in some cases, these are not firm commitments). Announcements of new power station build since the Energy Review Report demonstrate investors' preparedness to make decisions about new power stations on the basis of the policy framework that we set out in the Report.

5.1.14 Given that it is not at the moment technically or commercially feasible to store electricity on a large scale, some level of spare generation capacity is necessary in order to be able to meet electricity demand when, for example, power stations suffer unexpected outages or demand levels rise above normal. However, it is difficult to determine the "correct" level for this excess capacity. For instance, sustaining large amounts of spare capacity that is never called upon is expensive. On the other hand, if there is not enough spare capacity there is a higher risk that electricity supplies could be interrupted.

5.1.15 In a well-functioning market, the expectation that prices would be high and volatile in the event of a capacity shortage provides an economic incentive for the provision of some spare generation capacity. Market participants are exposed to high costs should they run short of power relative to their supply commitments and would have to resort to sourcing supplies elsewhere at short notice. Moreover, for any market participant, maintaining a buffer of spare capacity can be relatively inexpensive compared to the potential costs of there being a power shortage. Consequently, market participants do place a value in having some spare generation capacity available to mitigate the risk of shortages. These factors contribute to encouraging an excess of electricity generation capacity sufficient to accommodate fluctuations in demand and supply.

5.1.16 The extent to which companies will build new power stations depends on the expected profitability of such investments. Expected profitability will depend on how they believe factors such as fossil fuel, carbon and electricity prices, technology costs and regulatory/planning risks will evolve over time. Investors have indicated that uncertainties over the market and regulatory framework are particularly difficult to assess. For those investments at the margins of profitability, companies may decide to wait until such uncertainties are reduced, before investing. Given the importance of timely investment to ensure sufficient levels of generation capacity are available, regulatory

uncertainties can contribute to increased risks to security of supply. For this reason, it is important for Government to act to minimise regulatory uncertainty and in so doing, minimise the risks to security of electricity supplies.

5.1.17 We therefore need to ensure that our policy and regulatory framework provides investors with the certainty and incentives to deliver sufficient, timely investment in a diverse mix of electricity generation capacity that is consistent with our environmental and security of supply goals.

5.1.18 Given the size and complexity of the whole electricity system, from the generation of electricity to supplying end customers, it is impossible to guarantee supplies of electricity 100% of the time. For this reason, we need a set of electricity priority user arrangements which aim to protect certain critical users from power cuts during a national electricity shortage, in the highly unlikely event that a shortage does occur.

Analysis of future developments in electricity markets

5.1.19 To understand the wide range of factors which influence investment decisions we have undertaken analysis of a number of scenarios of the dynamics of investment in electricity generation¹²⁴ (see Box 5.1.3). This has helped us to understand the key issues and areas where we need to strengthen our market framework. This analysis has reinforced the findings reported in the Energy Review Report¹²⁵. In particular, we do not expect to see a significant increase in capacity-driven security of supply risks before around the middle of the next decade, based on the current framework. Even then, the probability and size of any “shortfall” are still likely to be very small, to be of short duration and to affect peak times.

5.1.20 Our analysis of possible interventions in the form of capacity mechanisms that could incentivise firms to build and/or maintain additional spare generation capacity has shown that whilst they have the potential to improve security of supply outcomes, they could impose significant costs and so may not provide an overall benefit to the UK. There are also risks associated with the design and implementation of such mechanisms which can lead to unintended and undesirable consequences. The difficulties inherent in devising capacity mechanisms include:

- creating opportunities for companies to use the system to their own advantage, thereby increasing costs to consumers but without bringing significant benefits;
- encouraging too much or too little investment;
- the risk that existing power stations will be disadvantaged unless capacity payments were also available to them; and
- other unintended consequences that may exacerbate the problems we are trying to address (e.g. higher carbon emissions or lack of diversity in the generation mix).

¹²⁴ Redpoint Energy, *Dynamics of GB Electricity Generation Investment: Prices, Security of Supply, CO₂ Emissions and Policy Options*, 2007.

¹²⁵ DTI, *The Energy Challenge: Energy Review Report*, July 2006 (<http://www.dti.gov.uk/files/file31890.pdf>)



BOX 5.1.3 MODELLING APPROACH

The analysis undertaken for this White Paper was aimed at understanding the factors that influence power station investment decisions. Improving our understanding of and ability to quantify the factors that delay or deter such investments allows us to better assess the probability and magnitude of the costs associated with high or volatile prices or possible electricity outages. The analysis also captures the implications of different scenarios and policy options on other key variables, such as CO₂ emissions.

The modelling simulates the decision making process of investors on the basis of: the underlying costs of new investment; investors' expectations of electricity prices given uncertain demand and supply scenarios; fuel prices and carbon prices; and the lead times associated with bringing new generation capacity onstream. The modelling captures the dynamic interaction between closure and new build decisions, their effect on outturn and expected prices and price volatility, and the effect these new price expectations have on the economics of existing and new power stations, and determining companies' investment decisions.

In assessing where possible imperfections of the current market framework lie and how these could be improved, our modelling attempts to capture some of the uncertainties affecting investor behaviour, including:

- the expected economics of new investment;
- the pattern of closures and new build that is driven by the commercial decisions of individual companies;
- expectations of future electricity demand; and
- interventions by Government, for example on climate change policy.

We have modelled a number of different possible future scenarios with the express aim of analysing the key factors that significantly affect investment behaviour. The outputs of the modelling under different possible scenarios include:

- the mix and the timing of new electricity generation capacity over the next 20-30 years;
- whether the amount of electricity generation capacity would be sufficient to meet our energy needs; and
- whether the new investment would be consistent with our carbon emissions reduction goals.

Despite its sophistication, it is important to recognise that this analysis is a modelling exercise. It does not remove the need for judgements about the risks presented and the costs/benefits of any interventions to address those risks. The outcomes of the analysis are also highly dependent on the required input assumptions because investment decisions in electricity generation rely on a complex interplay of factors including investors' expectations of future events e.g. fossil fuel and electricity prices, the future development of the EU ETS. In order to respond to this, we have undertaken modelling of a number of scenarios, using different input assumptions to explore differences in possible future investment behaviour.

Impact of investor behaviour on security of electricity supplies and carbon emissions

5.1.21 We modelled investment behaviour under a range of scenarios based on different cost and price assumptions including fossil fuel prices, carbon prices and the possible future development of the carbon market (for further details of the modelling approach see Box 5.3). In all scenarios modelled, investors respond to expected power station closures and higher electricity demand with significant new investment in power stations over the next two decades. Of critical importance for the UK's security of supply and carbon reduction goals however, is the timing and technology mix of these new power stations. In particular, the UK needs sufficient new electricity generation capacity to maintain the present high level of confidence that supply will be able to meet demand throughout this period. Additionally, this new build needs to be consistent with our environmental goals.

5.1.22 In most scenarios examined, we see some decline in the amount of capacity that is in excess of expected peak demand between now and the middle of the next decade. As a consequence, we could expect to see an increase in electricity prices and in the risk of supply interruptions, especially at peak times though the overall probability of a supply disruption would still be very small. The primary driver of this decline in spare capacity is the coincidence of closures of coal-fired power stations affected by the LCPD and by retiring nuclear power stations.

5.1.23 Our modelling indicates that limited visibility of future fossil fuel, carbon and electricity prices, and investor uncertainty over the continued existence and form of the EU ETS post 2012 are key factors affecting new investment decisions. These uncertainties increase investment risk, making it more difficult for companies to assess whether a particular power station investment will be profitable. Investors have highlighted that they are particularly concerned about international carbon frameworks after 2012, given that a post-Kyoto framework has yet to be agreed globally and the Directive underpinning EU ETS is under review, with changes set to take effect from 2012. This is why we attach a great deal of importance to successful negotiation on the strengthening of the EU ETS.

5.1.24 Our modelling also shows that by providing investors with greater certainty about the future carbon policy framework we can expect to see increases in the level of spare capacity and reductions in the volatility of electricity prices, bringing benefits to the wider economy by lowering the risk of electricity supply interruptions and reducing costs to the economy. Greater certainty over expected prices facilitates firms' assessment of the investment risks and returns of possible future projects. Additionally, greater certainty that the costs of carbon will be incorporated into electricity prices improves the economics of low carbon generation.

5.1.25 The combination of power station closures and type of new power stations built over time will affect carbon emissions. Whilst the scenarios assessed all show some improvements in the carbon intensity of the power sector, the results are very sensitive to assumptions about fossil fuel and carbon prices. These determine the choice of electricity generation technology and decisions by operators on how much they run coal and gas stations



respectively. For example, where fossil fuel and carbon prices favour coal-fired generation, carbon emissions will be higher than if prices favour a higher proportion of gas-fired generation.

5.1.26 In the same way that reducing the level of uncertainty in carbon market policy appears to reduce investment delays, it also increases the number of low carbon power stations that get built and consequently, reduces carbon emissions.

5.1.27 In comparing the low carbon generation choices available to investors, our analysis indicates that in the period up to 2030, nuclear (if available to investors as an option)¹²⁶ and renewables would be more likely to come forward than carbon capture and storage (CCS). This result occurs under all the combinations modelled and reflects the higher assumed costs of CCS relative to the costs of nuclear and the additional support provided through the Renewables Obligation. However, there remains considerable uncertainty about the costs of CCS because it has not yet been integrated and demonstrated with electricity generation on a commercial scale. The 2007 Budget announced that the UK will launch a competition to establish a commercial scale CCS demonstration on power generation; this demonstration will help provide a better understanding of the likely costs and timing of the wider deployment of this technology (see section 4 of this chapter for further details on CCS and the competition).

Policy conclusions

5.1.28 Our modelling and other evidence gathered since the Energy Review began in November 2005 has helped us to understand the key elements of uncertainty affecting companies' investment decisions – particularly future carbon and electricity prices and the future balance of electricity supply and demand. In addition, companies have highlighted other uncertainties which are at least partly under Government's control. For example, companies have pointed to the delays and uncertainty inherent in the UK's planning system as an important barrier to timely investment.

5.1.29 Given the difficulties of successfully developing and implementing any capacity mechanism, we believe that a policy response aimed primarily at reducing key policy and regulatory uncertainties, and at removing any unnecessary barriers to investment, will allow us to manage effectively future security of supply risks.

5.1.30 Our policy proposals for strengthening our electricity generation investment framework are therefore aimed primarily at reducing key policy and regulatory uncertainties by:

- strengthening the EU ETS and the carbon market;
- providing high quality forward looking information to facilitate timely investment in electricity generation;
- making immediate improvements to the planning regime for electricity

¹²⁶ Whether it would be in the public interest for new nuclear power stations to be an option available to companies making investments in new electricity generation capacity is subject to the consultation we are launching alongside this White Paper.

generation, and working towards more fundamental reforms of the planning system; and

- reducing policy uncertainty by clarifying our policy on renewables, carbon capture and storage and the next steps we propose to take on the issue of civil nuclear power.

Strengthening the EU ETS

5.1.31 This White Paper sets out the Government's aims to secure agreement to a number of changes that would strengthen and reinforce the EU ETS to provide firms with greater long-term carbon market certainty (further details on the EU ETS and valuing carbon are set out in chapter 1). We want the EU to:

- agree to a new and ambitious Directive. This will be based on proposals which the Commission should bring forward as soon as possible;
- make early decisions on emissions caps to provide business with confidence that there will be a meaningful, long-term carbon price. Announcing our long-term intentions for the EU ETS will provide early certainty for investors in low carbon technologies and signal EU-wide commitment to reducing carbon emissions beyond 2012. We need to signal the downward direction of EU emissions reductions much further into the future;
- set EU ETS caps to help deliver the EU's commitment to cut its greenhouse gas emissions in a cost-effective manner by 30% by 2020, in conjunction with other industrialised countries (and by 20% in any event). The carbon constraint imposed by the EU ETS should tighten over time;
- move towards increased auctioning of allowances in future phases of the EU ETS to improve the efficiency of allocating allowances, while taking account of competitiveness implications;
- allow carbon capture and storage installations to be brought within the scope of EU ETS during Phase II, and for them to be explicitly recognised in the Directive from Phase III;
- explore the potential to expand the scheme to cover additional sources of emissions, including surface transport, and press ahead with the inclusion of aviation;
- consider the scope for greater harmonisation of the ways in which Member States operate the scheme, particularly in areas such as allocation, to tackle concerns about competitiveness impacts; and
- move to ensure the EU ETS is at the centre of a global carbon market post-2012 by considering how the Directive should be amended to facilitate the future linking of the EU ETS to other schemes.

5.1.32 Full details of our strategy to strengthen the EU ETS are set out in Annex C to this White Paper. In March 2007 we published a paper calling for views on some of the key issues we believe are important to the future operation of the scheme¹²⁷. This will further develop our understanding of the views of industry, NGOs and other interested parties.

¹²⁷ Available on the DEFRA website at <http://www.defra.gov.uk/environment/climatechange/trading/eu/future/review/index.htm#5>



5.1.33 Further evidence of our determination to reduce carbon emissions is the UK's draft Climate Change Bill which creates a legal framework requiring us to put in place the necessary policies to deliver our carbon goals.

5.1.34 We are committed to strengthening the EU ETS to build investor confidence in the existence of a multi-lateral long-term carbon price signal. We will push for full clarity over the fundamentals of Phase III of EU ETS as early as possible in order to provide investors with sufficient information to form a view of the future carbon price to factor into investment decisions in the power sector. Given the scale of investment in new generation assets required in the UK over the next two decades, UK investors need clarity over carbon market fundamentals in good time if they are to make investment decisions consistent with the Government's energy policy goals. We will therefore keep open the option of further measures to reinforce the operation of the EU ETS in the UK should this be necessary to provide greater certainty to investors.

Providing better forward looking market information and analysis

5.1.35 In autumn 2007 we will introduce a new market information service. This will provide energy market information and analysis relating to supply and demand scenarios over a fifteen-year time frame.

5.1.36 The availability of high quality forward-looking information is critical to the efficient and effective operation of energy markets. Energy suppliers need to be able to anticipate changes in demand and power station closures sufficiently far in advance to invest in the necessary supply capacity and delivery infrastructure. Improved information will also help consumers make better informed decisions about the nature of the contracts they enter into for their energy supplies. Despite inevitable uncertainties over future events, high quality scenario analysis that makes use of current information and future trends can provide early warnings of potential market tightness and assist energy market participants with their investment decisions, whether they are energy companies or business customers. The new information arrangements will also help Government monitor the effectiveness of its policy framework. Full details of the new information arrangements are set out in chapter 4.

Improving the planning system

5.1.37 The planning system is becoming ever more challenging for potential investors. Although progress has been made by local authorities in handling planning decisions, more than 65% of firms in the UK believe that more should be done, and the recent Barker Review on land use planning found that there were still major delays associated with central Government decisions¹²⁸. Planning is consistently one of the top six concerns for inward investors in the UK. In chapter 8 of this White Paper, we set out the immediate changes we have made to improve the planning system for

128 Barker Review of Land Use Planning: Final Report – Recommendations, December 2006 (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf)

electricity generation projects, including new regulations to streamline and improve the efficiency of planning inquiries. We also describe the more fundamental reforms to the planning regime which are being taken forward in the context of the recent Planning White Paper.

Clarifying policy on specific technologies

5.1.38 In addition, we confirm in this White Paper our proposals to strengthen and modify the Renewables Obligation. These proposals to be implemented in 2009, will increase the level of renewables investment and deployment. More details are set out in section 3 of this chapter and in the renewables consultation document launched alongside this White Paper.

5.1.39 Following the announcement in the Budget in 2007, we set out in section 4 further details of the competition we will launch to develop in the UK demonstration of carbon capture and storage on power generation at commercial scale. We also set out the programme of work to remove regulatory barriers to the development of CCS. This is the first step towards creating a long-term future for the continued use of fossil fuels in electricity generation that is consistent with both our climate change and our security of supply goals.

5.1.40 Finally, in section 5 of this chapter, we include the executive summary of the nuclear consultation we are launching alongside this White Paper. This consultation will allow us to take a decision in the autumn on whether companies should be allowed to invest in new nuclear power stations as an option, alongside other forms of low carbon electricity generation in helping us tackle climate change and ensure security of energy supplies.

Updating and simplifying electricity priority user arrangements

5.1.41 The UK has a set of priority user arrangements in place to protect certain critical users from power cuts during a national electricity shortage, in the highly unlikely event that this occurs. We are currently reviewing the electricity priority user arrangements and will launch a consultation on these in summer 2007.



INVESTMENT FRAMEWORK

Summary of measures

We believe the UK's energy needs are best delivered by a liberalised energy market. The Government's role is to set the overall market and regulatory framework that enables companies to make timely investments consistent with the Government's policy goals on climate change and security of energy supplies.

We are bringing forward proposals to strengthen our existing electricity generation investment framework with the aim of reducing policy and regulatory uncertainty, and improving the functioning of the electricity market.

In this White Paper we:

- reinforce our commitment to the EU ETS, working with our international partners to strengthen the scheme to ensure it delivers a meaningful long-term carbon price signal. We also keep open the option of further measures to reinforce the operation of the EU ETS in the UK should this be necessary to provide greater certainty to investors. Additionally, the draft Climate Change Bill demonstrates the UK's determination to reduce carbon emissions;
- set out our plans to provide high quality forward-looking market information and analysis;
- explain how we will take forward a fundamental reform of planning for all energy infrastructure as part of the work set out in the Planning White Paper;
- describe the new regulations introduced in April 2007 that streamline the planning inquiry process for large scale electricity generation, bringing greater certainty to all participants;
- confirm and strengthen our commitment to the Renewables Obligation;
- set out further details of a competition to develop in the UK demonstration of carbon capture and storage on power generation at commercial scale, and a programme of work to remove regulatory barriers to the development of CCS;
- consult on whether it would be in the public interest for new nuclear power stations to be an option available to companies making investments in new electricity generation capacity with the aim of taking a decision on new nuclear later in the year; and
- announce our intention to review the electricity priority user arrangements and launch a consultation on these in summer 2007.

Section 5.2 – Networks

A secure and reliable electricity system requires timely investment in the power stations used to generate electricity. We also need investment in transmission and distribution networks to transport the electricity from the point of generation to the point of use.

5.2.1 Great Britain currently benefits from a high level of network reliability. However, over the coming years substantial investment is needed to respond to growth in electricity demand, to enable connection of new low carbon technologies and replace rapidly ageing assets.

5.2.2 This section:

- assesses the current performance of the network system;
- highlights the scale of the investment challenges we face in both transmission and distribution networks;
- explains the flexible investment mechanisms and increased allowances Ofgem have put in place to enable investment to support the growth of renewable generation; and
- describes the work that Ofgem will be taking forward jointly with industry to help ensure our networks are fit for the energy system in the long term.

The transmission and distribution system

5.2.3 In GB, electricity is transported over high and low voltage power lines. The transmission network (high voltage), on the whole, receives electricity from large power stations which in turn enters, via transformers, the low voltage distribution system. Most consumers receive their electricity from the low voltage network.

5.2.4 National Grid owns the England and Wales transmission system, with Scottish Power and Scottish and Southern Energy each owning a part of the transmission system in Scotland. As transmission owners, these companies are responsible for building and maintaining safe and efficient networks and are regulated by Ofgem. National Grid (NG) also has the responsibility of overseeing and managing the flow of electricity across the whole GB transmission network, including the elements owned and operated by Scottish Power and Scottish and Southern. In this role, National Grid is known as the transmission system operator.

Performance since privatisation

5.2.5 Controllable costs of the network companies have fallen by up to 50% since privatisation, while operational performance has improved. The electricity transmission system has operated with a reliability of very nearly 100% (historically between 99.9997 and 99.9999%). Very little electricity has been lost from unplanned outages. GB distribution network reliability is also



among the best in Europe according to a recent CEER benchmarking report, *Third Benchmarking Report on Quality of Electricity Supply*¹²⁹. Power cuts relating to underlying performance (i.e. leaving aside the impact of major storms) are down by 20% since 2002.

5.2.6 Some electricity is lost – mainly as heat – as it is transmitted through the networks. Less than 2% of electricity is lost over the transmission network, with around 5% lost over the distribution system. The network businesses are incentivised to reduce losses through a range of measures, and performance continues to improve.

Need for significant investment in the electricity transmission network

5.2.7 Whilst the current transmission system is clearly operating highly effectively it will need significant investment to ensure we maintain this high level of system performance and reliability of electricity supply. This investment is required because of the ageing of the transmission networks and the need to connect and transmit electricity from renewable generation. Ofgem has already recognised the importance of providing appropriate funding for asset renewal. It has also designed flexible funding and investment mechanisms so that transmission companies can deal with the different demand and generation patterns that might emerge in the future.

5.2.8 Ofgem has recently agreed price control funding arrangements with the transmission network owners for the period of 2007-12. These arrangements incorporate considerable allowances for capital investment for transmission owners, totalling over £5.1bn across the gas and electricity transmission systems. For the electricity element, which sums to around £4.3bn, the allowances represent an increase of 160% over the previous five-year price control period. These allowances include funding for the rapid growth in demand for transmission investment in Scotland as a result of new renewable generation projects. Ofgem considers that the agreed transmission funding arrangements provide an appropriate balance of risk and reward for the transmission companies, whilst offering good value to the consumer. The funding provided should enable the transmission companies to continue to operate their systems at the same high level of reliability and maintain a high level of customer service.

5.2.9 Much of the new transmission investment is driven by the needs of the generation companies that use (or plan in the future to use) the network. The plans for additional investment in the transmission system recognise that there is a large volume of primarily wind electricity generation that will connect to the transmission system over the coming years. However, the exact volume and timing are uncertain and, as a result, connection of these renewable generation stations presents new challenges.

¹²⁹ http://www.ceer-eu.org/portal/page/portal/CEER_HOME/CEER_PUBLICATIONS/CEER_DOCUMENTS/2005/CEER_3RDBR-QOES_2005-12-06.PDF

5.2.10 The uncertainty over future demand for network investment is one of the reasons that Ofgem has developed flexible funding mechanisms for transmission businesses through the price control process. These mechanisms are designed to ensure that network companies receive appropriate allowances on an ongoing basis for connecting new generation.

5.2.11 These mechanisms also enable Ofgem to link network investment funding to long-term financial commitments by the generators wishing to use the network. These financial commitments help electricity transmission companies to identify where to invest, and will reduce the risk that business and domestic customers have to pay for unnecessary investment.

5.2.12 In addition to flexible funding mechanisms, Ofgem is working with industry to develop measures to make it easier to connect new generation in the shorter term. Amongst these measures are: greater clarity as to the terms of connection offers, greater flexibility in connection offers, and enhancing the consistency between connection offers and the practical considerations arising from planning consents. More details on these and other examples, where the Government and Ofgem are working together to make improvements to the current system, are set out in the Renewables section of this chapter (see 5.3).

Need for investment and flexibility in the electricity distribution system

5.2.13 As in the case of transmission, Ofgem recognised the need for increased investment in the distribution networks in its last electricity distribution price control review. Ofgem increased funding allowances for investment for the period 2005-10 by approximately 50% over levels of expenditure in 2000-05. The Distribution Network Operators' (DNOs) capital investment funding over the period total more than £5.7bn. Ofgem also introduced new incentives to encourage innovation and strengthened incentives to improve network reliability and reduce losses. Network investment has had a positive effect on network reliability, with a 20% reduction in the duration of power cuts following the introduction of explicit incentives in 2002¹³⁰.

5.2.14 Most of the electricity distribution companies are now indicating that the investment allowances set by Ofgem at the last review are higher than they are choosing to spend in the period 2005-10¹³¹.

130 Ofgem: 2005-06 *Electricity Distribution Quality of Service Report*, December 2006, available at www.ofgem.gov.uk notes a 20% reduction in customer minutes lost.

131 Ofgem: *Electricity Distribution Cost Review 2005-06*, January 2007, available at www.ofgem.gov.uk explains that, in aggregate, the electricity distribution companies now intend to spend 95% of the capex allowances set by OFGEM at the last electricity distribution price control review.



Dynamic investment allowances and sustainable development

5.2.15 Ofgem has worked closely with the transmission and distribution licensees to develop a suite of price control proposals that incentivise investment to connect renewable and distributed electricity generation and improve the environmental performance of the electricity network. This is being done by:

- allowing companies flexibility in the level of funding that is provided in the event that extra generation, particularly renewable generation, wishes to connect to the transmission system;
- providing incentives for companies to reduce the leakage rate of sulphur hexafluoride, a major greenhouse gas; and
- preparing a new regime to provide for offshore generation network connections (see section 5.3 of this chapter).

Long-term scenario planning

5.2.16 It has been argued that funding for transmission investment through the price control process should be set for periods longer than five years in order to provide distribution and transmission companies with more confidence to invest. But levels of investment needed more than five years ahead are highly uncertain. In fact, recent experience suggests that licensees are already facing increasingly varied network demands which are difficult to predict even within the timeframe of a five-year price control. As outlined above, Ofgem has therefore taken the view that a better way to provide investment confidence is by enabling funding to be more flexible and linked to changes in demand.

5.2.17 However, the flexible approach within the existing price controls does not address the need to consider and examine possible longer term scenarios. For example, it is important to ensure that the flexible five-year allowances set in price control periods are compatible with any plausible longer term outlook for the network. Ofgem therefore intends to look at a range of future scenarios that could arise as a consequence of Government policy and market development including, for example, a significant shift in the UK fuel mix and the associated integration of renewable generation capacity with intermittent or variable output.

5.2.18 The scenario analysis is likely to focus on medium and long term timeframes, stretching several decades ahead. It will also look at the drivers of future energy demand and potential changes to the supply side. On the demand side, key issues will include the growth in demand for energy services, the scope for energy efficiency, technological and social trends and the requirements to meet carbon emissions limits. On the supply and generation side, key areas for consideration will include the different fuels and technology types likely to proliferate, fuel security and the development of a viable decentralised system (including microgeneration) alongside today's predominately centralised system.

5.2.19 Ofgem will publish an open letter in May 2007 giving notice of its intention to convene a cross-industry workshop. The workshop, expected in summer 2007, will consider longer term scenario planning issues and will have the following aims:

- to establish a process for further work on scenario planning;
- provide a clear timeline for this work;
- seek views from the industry of the major challenges for the future of energy markets and the implications for the electricity networks; and
- agree how the work will be made publicly available.

5.2.20 Following the workshop Ofgem will convene further industry meetings as appropriate. Ofgem's role in the process will mainly be to provide guidance and a framework for scenario planning work to be conducted by industry. Ofgem expects to publish its first report on long term scenarios for the electricity networks in the first half of 2008.



Section 5.3 – Renewables

The UK has some of the richest renewable resources in Europe – particularly in terms of our wind and marine (wave and tidal stream) resources. If they can be captured effectively they can make a significant contribution to our long-term energy goals relating to climate change and security of supply.

5.3.1 In this section, we set out:

- the progress made in deploying renewable electricity generation, and the barriers to the further development of UK renewables in the short, medium and long term; and
- actions being taken to tackle those barriers including:
 - how we intend to strengthen and modify the Renewables Obligation;
 - how we will reduce uncertainty and shorten overall timescales in the planning process for renewables projects; and
 - how we will improve access to the grid for onshore and offshore renewables generation.

5.3.2 The Devolved Administrations have an important role to play in respect of supporting electricity generation from renewables. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals in this chapter which touch on devolved matters will be progressed in accordance with the principles set out in the Memorandum of Understanding.

Renewable energy has a key role to play in reducing carbon emissions and achieving security of supply

5.3.3 Renewable energy is an integral part of the Government's strategy for reducing carbon emissions as renewable energy resources produce very little carbon or other greenhouse gases¹³². For every 1GW of fossil fuel fired electricity generation capacity displaced by an equivalent amount of renewable electricity, carbon emissions would be around 0.7MtC to 1.5MtC lower.

5.3.4 Renewables can also make a contribution to security of supply, by diversifying the electricity mix and reducing the need for energy imports. However, some renewables, such as wind, are variable (often described as intermittent). Above a certain level these security of supply benefits have to be weighed against potential disadvantages arising from having a larger proportion of UK electricity generation coming from variable sources.

5.3.5 Recognising the potential benefits of renewables to the UK's energy objectives, in 2002 the Government introduced the Renewable Obligation

132 Sustainable Development Commission, *The Role of Nuclear Power in a Low Carbon Economy, Paper 2: Reducing CO₂ emissions – nuclear and the alternatives*; March 2006.

(RO) to drive and support the growth of renewables generation. The Obligation allows generally higher cost renewable electricity generation to compete directly with conventional, fossil fuel based electricity generation¹³³. The Government further underlined its commitment to renewables by setting a challenging target of increasing renewable electricity generation to 10% of electricity by 2010. It also set out an aspiration to double this by 2020.

5.3.6 Renewables also form a part of Europe's climate change and energy policy. In March 2007, the European Council agreed amongst other things, a binding target of a 20% share of renewable energies in overall EU consumption by 2020. This applies to transport and heat as well as electricity. The agreement also commits the EU to a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action. The EU Commission has been asked to bring forward detailed proposals for each Member State's contribution to the overall EU renewables target. After a decision has been reached, and each Member State has agreed its contribution, we will bring forward appropriate policies to deliver the UK's share.

5.3.7 The UK has a significant tidal energy resource which could make a major contribution to the UK's supply of renewable energy. In Box 5.3.1 we set out details on the Sustainable Development Commission's study in this area.

BOX 5.3.1 TIDAL POWER

A major study led by the Sustainable Development Commission (SDC) is currently underway that is looking at issues related to harnessing tidal power in the UK. Tidal power represents a significant untapped resource. The geography of the UK means that we are particularly well positioned to harness the power of the tides to generate cleaner energy.

The SDC study will consider a wide range of locations and technologies, including the potential of tidal power in the Severn Estuary and the proposals for a tidal barrage there, which could potentially supply up to 5% of the UK's electricity demand from a renewable, low carbon source. Tidal power could make a significant contribution towards meeting the twin challenges of climate change and security of supply.

The SDC is considering, in its study, a broad range of issues including environmental impacts, financing, and public acceptability of the various options. The SDC's final report, which is expected in September 2007, will assess the role of tidal power in a low carbon electricity system from a sustainable development perspective. The Government will consider the SDC's report and recommendations before indicating what it considers to be appropriate next steps.

¹³³ A fuller explanation of the Renewables Obligation is set out in box 5.3.2 and at <http://www2.dti.gov.uk/energy/sources/renewables/policy/obligation/page15630.html>



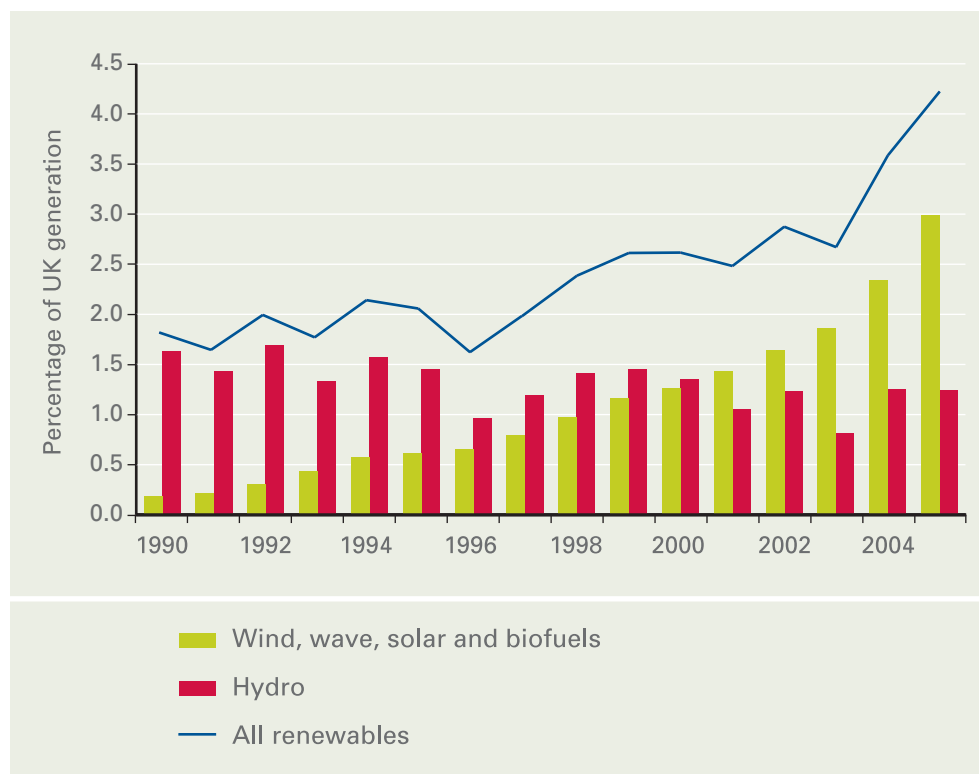
What progress have we made in deploying renewable electricity generation in the UK?

5.3.8 UK renewable electricity generation has increased significantly since 2002. In 2006 electricity supplied from RO eligible sources stood at around 4% of the UK's total, up from 1.8% in 2002.

5.3.9 Since January 2006 we have seen the installation of more than 540MW of wind and around 80 MW¹³⁴ of other renewables, including landfill gas, photovoltaics and biomass. More than 2GW of wind is now connected to the grid – with the first GW taking around 14 years to become operational and the second only 20 months. A further 1,260 MW of renewables capacity is under construction; 4,600 MW has been consented, and 11,400 MW is in planning processes across the UK. We estimate that around £1billion has been either invested or committed to new UK renewable projects in the past year.

5.3.10 Figure 5.3.1 shows the rate of progress on renewables growth since 1990.

FIGURE 5.3.1. GROWTH IN ELECTRICITY GENERATION FROM RENEWABLE SOURCES SINCE 1990



Source: DTI 2006

134 Renewable Energy Statistics Database – www.restats.org.uk/2010_target.htm

5.3.11 Progress continues to be made and the rate of deployment is forecast to grow through 2007 and beyond:

- construction has started on Europe's largest onshore (322MW) windfarm at Whitelee, in Scotland;
- construction on a fresh round of offshore wind projects has started or will start shortly. These include Robin Rigg (180MW), Lynn (90MW), Inner Dowsing (90MW), and Gunfleet Sands (180MW). All of these projects are being supported under the Government's £97 million offshore wind demonstration programme;
- a further 1.9GW of offshore wind has been consented, including the London Array offshore wind farm, which at 1GW will be the world's largest offshore wind farm; and
- new biomass projects to be commissioned during 2007 will include the UK's largest dedicated biomass plant at Lockerbie (44MW) and a 30MW project at Wilton.

The challenges

5.3.12 Despite good progress to date, there are barriers slowing the rate of renewables deployment in the UK in both the short and long term:

- Firstly, the most competitive renewable technologies, such as onshore wind and hydropower, are either constrained by the scarcity of suitable sites or, in the case of co-firing of biomass with coal generation, by caps on the total level of generation qualifying for support under the RO. In addition the maturing technologies, like offshore wind and biomass, that we will rely on for the next phase of renewable electricity deployment are proving more expensive than anticipated. As a result, in its current form, the RO will not deliver sufficient financial support to deploy these at the levels needed to keep us on track towards our 20% aspiration.
- Secondly, securing planning consent for renewables, and in particular onshore wind, can be an especially difficult process, with developers facing uncertainty and significant risk of delays. There is currently more than 11GW of renewables capacity awaiting consent under the planning system¹³⁵.
- Thirdly, there are significant challenges and delays in connecting renewables generation projects to the transmission and distribution network, affecting both onshore and offshore renewables.

5.3.13 In the following sections, we set out the actions we are taking to tackle each of these challenges.



Strengthening and modifying the Renewables Obligation

5.3.14 The RO has been successful in stimulating investment in renewable energy projects. It does this by placing an Obligation on licensed electricity suppliers to source an increasing proportion of their electricity sales from renewable sources or to pay a penalty (the buy-out price). The RO's aim is to provide a framework of financial incentives to invest in renewables with the long-term goal of supporting the transition of renewables into the mainstream of the UK's competitive electricity market. The level of the Obligation is currently set to increase in annual steps from 7.9% in 2007/08 to 15.4% by 2015, and to remain at that level until 2027 when the mechanism will end. Generators receive an RO Certificate (ROC) for each 1MWh of renewable electricity they generate. These are sold to electricity suppliers, allowing them to demonstrate how much renewable generation they have sourced. Details of the RO scheme are given in Box 5.3.2.

BOX 5.3.2 THE RENEWABLES OBLIGATION

The buy-out price is the fixed penalty that an energy supplier pays for each MWh that it falls short of its obligation. The buy-out price is linked to the Retail Price Index (RPI) and for 2007/08 the price is £34.30 per MWh. The suppliers pay this money into an account administered by Ofgem (the Buy-out Fund) and each year the accumulated Fund is shared among those suppliers who have presented RO Certificates (ROCs). The combination of the buy-out price and the extent to which suppliers have fallen short of their obligations determines the nominal value of a ROC and the total support available for each MWh of renewable electricity under the RO. When the Obligation as a percentage of total electricity supplied is greater than the share of actual renewable generation, the value of a ROC will be by definition greater than the buy-out price.

5.3.15 The RO was designed to bring forward the most cost-effective technologies first and it has been very successful in doing this. However, if we want to move significantly beyond 10% renewables we need to bring forward other renewable technologies, particularly offshore wind and biomass. To encourage investment in these technologies, as well as continuing investment in onshore wind and other more developed sources of renewables generation, we need to provide appropriate levels of support, reflecting the development and technology risks and the costs of each technology. We also need to give investors the certainty they need to commit to renewables investment.

5.3.16 In the Energy Review Report we set out our proposals for strengthening the performance of the RO. These included:

- a commitment to raise the RO to 20% on a "guaranteed headroom" basis i.e. so that the obligation level is only raised when the growth in renewables generation justifies it;
- breaking the RPI link from 2015-16 to keep the overall costs to consumers broadly similar to those within the existing projections; and

- proposals to “band” the Obligation to differentiate levels of support to renewable technologies to maximise the contributions from established and emerging technologies.

5.3.17 We published a consultation document – *Reform of the Renewables Obligation and Statutory Consultation on the Renewables Obligation Order 2007*¹³⁶ – in October 2006 seeking views on these proposals. The consultation closed on 5 January 2007¹³⁷.

5.3.18 The majority of the responses to the consultation supported the proposals set out in the Energy Review Report as the best way to improve the RO within the current funding regime.

5.3.19 Some respondents expressed a preference for additional capital grant support but recognised that given the significant overall funding support already available for renewables, additional capital grant support was unlikely and that reform of the existing scheme was therefore necessary. A minority of respondents proposed replacing the Obligation on the grounds that it is not cost effective and does not provide sufficient certainty to investors. A number of other mechanisms were proposed, including Government-backed ROC contracts and a feed-in tariff system.

5.3.20 We have given these issues serious consideration but do not believe that there is a strong case for radical change. While a number of other EU member states have used mechanisms such as feed-in tariffs, it is hard to draw firm conclusions as to the effectiveness of these mechanisms from international comparisons, as other forms of support also vary. For example, some other EU Member States offer preferential access to the grid alongside any direct financial support. The UK's previous renewables support – the Non Fossil Fuel Obligation (NFFO) – was a feed-in tariff scheme but was not itself successful in supporting mass deployment of renewable capacity.

5.3.21 The Government therefore remains firmly committed to the RO as the principal means of driving the deployment of renewable electricity in the UK. And we have taken account of the strong message from respondents about the need for certainty and continuity in order to build on existing levels of investment. However, we also recognise the need to make changes to the RO's structure to improve its overall performance. Our view is that our proposed package of modifications, in particular banding, will address many of the concerns that have been raised.

5.3.22 Any plans for modifying the RO have also to take into account the likely future developments both in the market and in other policies which bear on the industry. For example, market developments are likely to include changing costs for projects (driven by technology developments and by shifts in the international market for items such as wind turbines). Changes in the regulatory environment will include future phases of the EU Emissions Trading Scheme (ETS) and the consequent cost of carbon dioxide emissions faced by fossil fuel generators (affecting wholesale electricity prices) and proposed major reforms to the planning and grid connection regimes.

¹³⁶ <http://www.dti.gov.uk/files/file34470.pdf>

¹³⁷ Responses to the consultation are available at

<http://www.dti.gov.uk/energy/review/implementation/renewables-obligation/page34483.htm>



5.3.23 The further ahead we look, the greater the uncertainty about: future technology costs; the likely carbon price under the EU ETS; the future wholesale electricity price; and the impact of our measures to improve planning and grid access. It is against this background that we have undertaken analysis and modelling of renewables deployment for this White Paper.

5.3.24 This analysis has revised our estimate of the level of renewable electricity generation that the existing RO will deliver. Latest estimates based on central projections for electricity prices suggest that the RO in its present form will deliver around 11.4% of the electricity supplied by 2015/16 (the point when, under the existing regime, the Obligation would reach, and level off at, 15.4%). This is lower than earlier projections and is a result of the rising costs in many of the major technologies over the last year or so. Costs for key elements such as wind turbines have risen by some 25% over the past 1-2 years and look set to rise further over the next 2-4 years because of the rising prices of major commodities such as steel and the increased international demand for the finished product. This further underlines the case for the changes we propose to make to the RO if we are to make additional progress on renewables deployment.

5.3.25 On the basis of the consultation responses and our further analysis, we therefore confirm in this White Paper our intention to increase the Obligation level to up to 20% on a guaranteed headroom basis and to introduce banding. In the longer-term we expect the EU ETS to mature and make renewables a relatively more attractive option.

5.3.26 The recent changes observed in the costs of renewables technologies underline the challenges in making precise predictions about renewables deployment in the longer term, and in designing our policies to maximise deployment. Although developing rapidly, many of the renewables technologies supported under the RO – and the international supply chains that support them – are still maturing and costs will therefore continue to vary over the medium-term. In designing the changes to the RO set out in this White Paper, we have sought to maximise renewables deployment in the period up to around 2013-2015. Although still uncertain, we can be more confident about the projected impact of our proposals up to that point.

5.3.27 We summarise the broad thrust of our decisions below. The detail is set out further in the consultation document we are publishing alongside this White Paper.

Obligation levels

5.3.28 The Government remains committed to its existing decisions on Obligation levels and to retaining the Obligation until 2027.

5.3.29 We will raise Obligation levels to up to 20% on a “guaranteed headroom” basis – our aim is to raise the Obligation as necessary to keep it ahead of the actual levels of generation. The “guaranteed headroom” approach will be used to revise current Obligation levels – set out to be 15.4% in 2015/16 – if they are likely to be exceeded by the level of renewable electricity generation on the system.

5.3.30 Banding is likely to result in a change to the currently direct 1:1

relationship of one ROC being awarded for each 1MWh of electricity generation. Therefore, alongside the proposals on banding, we propose to change the way the Obligation is set so that in the future it will be defined in terms of the number of ROCs rather than in terms of output of renewable generation. This will help to provide greater certainty for investors, the need for which was emphasised by respondents to last year's consultation.

5.3.31 We believe this revised approach to setting long-term Obligation levels has the additional benefit of managing future costs to consumers, by linking growth in the Obligation to the renewable sector's ability to deliver. It also gives greater certainty to investors for the period up to and beyond 2015-16.

The RPI indexation of the RO buy-out price

5.3.32 In the Energy Review Report, the Government proposed removing from 2015-16 the link between the buy-out price under the RO and the Retail Price Index (RPI). The intention was to mitigate the expected increase in the cost of the RO to consumers once the obligation began to rise above the previous 15.4% limit.

5.3.33 Since that time we have seen rises in the costs of renewable electricity technologies. Moreover, new analysis¹³⁸ commissioned to inform our banding proposals indicates that we are likely to see further rises in the costs of renewable electricity technologies in the period to 2010. The implication of this is that the projected deployment of renewables is now lower than at the time we published the Energy Review Report. The updated analysis therefore indicates that the projected level of renewables deployment for the banding regime under consideration would lead to a fall in the total financial support provided by the RO when compared to the existing regime, even though it would still increase the overall level of renewables deployment. A number of respondents to the recent renewables consultation made a similar observation and argued strongly against the removal of the RPI link from 2015-16 on the basis that it would lead to an overall reduction in the support available to renewables.

5.3.34 One of our objectives when considering proposals to band the RO was to increase deployment of renewables, while maintaining broadly similar costs to consumers. The Government has therefore decided to retain the link between the buy-out price and RPI from 2015-16 as part of confirming new proposals to band the RO. This will provide a greater stimulus for the deployment of renewables over the lifetime of the RO. A banded RO retaining RPI is predicted to deploy around 40% more renewables between 2009 and 2015 than the current regime would have over the same period.

"Banding" the Renewables Obligation

5.3.35 Banding means that technologies could be awarded more or less than one ROC for each MWh of electricity they produce depending on the stage of the technological development and associated costs. The aims are to bring forward emerging renewable technologies; increase deployment; and improve the overall cost effectiveness of the RO. In particular, banding recognises the practical constraints that apply to the most mature renewable technologies, such as onshore wind, and help us bring forward the next generation of

138 Ernst and Young: *Impact of Banding the Renewables Obligation: Cost of Electricity Production 2007* – available at www.dti.gov.uk/energy/whitepaper



renewable technologies. We believe “banding” achieves the best balance between the overall cost effectiveness of support for renewables deployment and investor confidence. We will, however, continue to support emerging renewable technologies that are not yet close to mass deployment through other measures (see discussion of emerging technologies below).

5.3.36 The bands will be set on a market-based assessment of the development of different groupings of renewable technologies rather than on a technology specific basis. This approach has a number of advantages over a technology specific approach, including:

- it reduces the complexity of banding; and
- avoids the risks inherent in attempting to define the levels of support too narrowly.

5.3.37 We are publishing alongside this White Paper a consultation on proposals based on four technology bands covering the span of technologies from the lowest cost to the higher cost, emerging technologies (these are set out in Table 5.3.1). With the exception of co-firing (discussed below), we propose that bands be fixed until March 2013 in the first instance, shortly after Phase III of EU ETS is expected to come into effect.

5.3.38 We intend that subsequent reviews of the bands will be in line with future phases of EU ETS. Criteria for deciding any future adjustments will be set out in advance to ensure that changes in future support levels for new projects are understood and predictable. Retaining the option to review support levels but on a clearly defined and prescribed timetable gives policy makers flexibility to adjust support levels for new projects to reflect changing market conditions and the rate of technological advance while minimising impacts on developer certainty and investor confidence.

Table 5.3.1 Proposed banding regime

Band	Technologies	Level of support ROCs/MWh
Established	Sewage gas; landfill gas; co-firing of non-energy crop (regular) biomass	0.25
Reference	Onshore wind; hydro-electric; co-firing of energy crops; energy from waste with combined heat and power; other not specified	1.0
Post-demonstration	Offshore wind; dedicated regular biomass	1.5
Emerging technologies	Wave; tidal-stream; advanced conversion technologies (gasification, pyrolysis and anaerobic digestion); dedicated biomass burning energy crops (with or without CHP); dedicated regular biomass with CHP; solar photovoltaics; geothermal	2.0

5.3.39 We will also work to ensure the success of our banding proposals by:

- giving industry confidence in the band setting process. We are therefore proposing to put in place arrangements to provide Ministers with independent advice on future support levels; and
- ensuring the band reviewing process is open and transparent. This will be based on a thorough assessment of costs and market developments, and will involve consultation with industry and other interested parties.

More details of our key proposed principles for banding are set out in the accompanying RO consultation document.

Treatment of co-firing under a banded RO

5.3.40 As explained in the Energy Review Report we believe that co-firing continues to have a role to play in reducing carbon emissions from conventional generation stations, particularly coal. Co-firing is also one of the most cost-effective renewable technologies. From 1 April 2009, the current caps on co-fired ROCs will be removed and the level of support co-firing receives will be reduced.

5.3.41 We do not propose to grandfather co-firing over the lifetime of the RO but will adjust the level of support according to need (see below for broader proposals on grandfathering). We set out the reasons for this proposal in the consultation document.

5.3.42 We believe there is a case for continuing to support energy crops so as to promote the development of an effective domestic supply chain for this valuable resource. From 1 April 2007, co-firing of energy crops was removed from the current co-firing caps. We also propose that co-firing energy crops receive more support than other forms of co-firing, including for the necessary capital investments. Taken together we believe these measures, in addition to other measures in the *Biomass Strategy*¹³⁹, will continue to promote the development of the energy crop sector.

5.3.43 It is important to ensure that co-firing and large dedicated biomass schemes are sustainable over the long-term. We will therefore require co-firers and developers of larger biomass power stations to submit to the regulator an annual report on the biomass they have used, its origins, and whether it has been sourced under existing codes of practice or accreditation schemes, for example, the UK Woodland Assurance Standard¹⁴⁰ and the Roundtable on Sustainable Palm Oil¹⁴¹.

Treatment of energy from waste under a banded RO

5.3.44 Generating energy from that portion of waste that cannot be prevented, reused or recycled has both energy and waste policy benefits. Energy generated either directly from waste or through the use of a refuse-derived fuel has benefits for security of supply. In addition, the biodegradable fraction of waste is a renewable resource. The RO will remain open to the biomass fraction of waste used in good quality CHP stations and power stations using gasification, pyrolysis, and anaerobic digestion. The respective

139 The Biomass Strategy is published alongside this White Paper, refer to <http://www.dti.gov.uk/energy/whitepaper>

140 <http://www.ukwas.org.uk/>

141 <http://www.rspo.org/>



levels of support for the different technologies are shown in Table 5.3.1. We also propose to bring forward new legislation which will enable us to overcome the current barriers to eligible energy-from-waste power stations receiving ROCs. More detail on this and other deregulatory measures seeking to reduce biomass fuel costs and promote biomass CHP are set out in the consultation document accompanying this White Paper¹⁴².

5.3.45 Anaerobic digestion is an emerging technology which is currently under-developed in the UK. It offers the potential to generate renewable energy – not only electricity, but also heat and fuel – from manures and slurries and certain organic wastes such as food waste, whilst at the same time mitigating methane emissions from agriculture and landfill¹⁴³.

Grandfathering

5.3.46 We recognise the impact that changes to the RO could have on investor confidence. We therefore aim to reflect this in the treatment of existing projects with the detailed definition of ‘existing projects’ to be confirmed through the consultation on the RO we are launching alongside this White Paper. Our proposal is that following the introduction of “banding” currently planned for 1 April 2009¹⁴⁴ all projects that would otherwise be eligible for less than one ROC per MWh and which:

- have commenced operation by that date; or
 - have received planning permission and pre-accreditaion from Ofgem by that date and subsequently commence operation within two years;
- will remain eligible for one ROC per MWh.

5.3.47 Those projects¹⁴⁵ that became operational after 11 July 2006 (when our banding proposals were first raised) and following the introduction of banding, fall within a higher band will receive the new (higher) number of ROCs from the moment that banding comes into force. Those projects that became operational on or before 11 July 2006 and, following the introduction of banding, would otherwise have fallen within a higher band, will remain eligible for one ROC per MWh only.

5.3.48 We set out the exceptions to the grandfathering principle in the RO consultation document.

Impact of these proposals

5.3.49 Recent analysis of the renewables market and renewables technologies costs has revised our estimate of the level of renewable electricity generation that the existing RO regime is likely to deliver. As already mentioned, modelling by Oxera for this White Paper¹⁴⁶ suggests that the RO in its present form would deliver a central estimate of 11.4% of the electricity supplied in 2015-16. This is lower than earlier projections and is a result of rising costs for many of the major renewables technologies over the past 1-2 years.

¹⁴² <http://www.dti.gov.uk/energy/whitepaper/consultations>

¹⁴³ The Biomass Strategy and the accompanying Anaerobic Digestion Working Paper set out how we will work with interested parties to drive a faster growth in anaerobic digestion by local authorities, businesses and farmers.

¹⁴⁴ The target date for implementation is 1 April 2009 subject to the availability of Parliamentary time and State Aids clearance.

¹⁴⁵ The Grandfathering process is set out in the more detail in the accompanying consultation document.

¹⁴⁶ Oxera Consulting Ltd. *Reform of the Renewables Obligation – What is the likely impact of changes?* 2007; <http://www.dti.gov.uk/energy/whitepaper>

5.3.50 In the preferred banding regime identified above, we estimate that the level of renewable generation delivered by the RO will grow from around 25TWh to around 47TWh between 2009 and 2015. This growth in renewables will bring about a further change in the generation mix, thus making the electricity sector less carbon intensive.

5.3.51 As mentioned above, we have focused the design of the new regime on maximising the renewables deployment we might achieve by around 2013-15. We can be more confident about the projected renewables deployment over this time frame than we can over the long-term. This is because the further we go into the future the greater the level of uncertainty around key assumptions such as technology costs, the carbon price and wholesale electricity prices. Moreover, focussing on this time frame is consistent with the date we first intend to review the bands we are proposing to put in place (i.e. 2013). By around 2013, we will know more about, for example, likely future renewable technology costs as well as how Phase III of the EU ETS has unfolded.

5.3.52 Modelling for this White Paper shows that our proposals could increase the electricity supplied from renewables by up to around 8TWh in 2015 relative to the RO in its present form. By 2015-16, some 13.5% of electricity demand is estimated to be supplied by renewables eligible under the RO. By including those renewables that are not eligible for support under the RO, this would bring the projected total amount of electricity supplied from renewable sources to around 15% by 2015-16.

5.3.53 The additional growth in renewables delivered by our proposals will also contribute to our security of supply by increasing the diversity in the electricity mix by reducing reliance on gas-fired technology and thereby reducing our demand for gas¹⁴⁷.

5.3.54 Based on our central projections – albeit with the caveats highlighted above – about the particular uncertainty associated with projecting the deployment for developing technologies such as renewables into the long term – we estimate that renewables would represent around 15% of the UK's electricity sales in 2020, reducing our projected carbon emissions by around a further 0.8 million tonnes of carbon. More details on the impact of our proposals to strengthen and modify the RO are set out in chapter 10 of this White Paper and in the accompanying RO consultation and Regulatory Impact Assessment published alongside it.

¹⁴⁷ Assuming renewables replaces gas fired generation, it would reduce gas demand by up to 1.3 billion cubic metres.



Support for emerging technologies in a banded RO

5.3.55 While the Government intends that emerging technologies generating electricity from a renewable source (such as wave and tidal and advanced waste conversion technologies) will benefit from some additional revenue support through RO banding, we believe that revenue support alone is not the best way to promote the demonstration and early deployment of these technologies in all cases, especially as the costs and performance characteristics are relatively uncertain.

5.3.56 Emerging technologies require targeted support in these early phases. This means both financial support as well as the wider development framework – for example, supportive planning and infrastructure regimes can reduce risk, accelerate development and deployment, and promote learning.

5.3.57 Therefore, while banding will provide a longer-term market pull for emerging technologies, we believe capital grant schemes and tailored policy initiatives are the appropriate and more cost effective mechanisms for reducing commercial risks at the earlier stages of technology development and demonstration. Maintaining the focus of the RO on those technologies which can deploy at lower and more certain cost, and at a large scale, also best serves our medium-term carbon reduction and security of supply goals. As emerging technologies develop, they will increasingly benefit from a banded RO. Future reviews of the levels of banded support will consider the position of these technologies and the appropriate level of support to facilitate deployment.

5.3.58 Funding for the capital costs of developing emerging energy technologies will therefore still be needed. The new Energy Technologies Institute and Environmental Transformation Fund are the means of providing it. These will complement support provided through the banded RO. More details can be found in chapter 6.

5.3.59 We currently support wave and tidal technologies through the existing Marine Renewables Deployment Fund (MRDF). We will continue to provide support for the demonstration and deployment of marine renewables alongside the banded RO. This support is likely to form part of the Environmental Transformation Fund.

5.3.60 Microgeneration remains an important contributor to renewables generation. We have already taken steps to make it easier for microgenerators to gain access to the benefits of ROCs (see below). We are also bringing forward proposals for microgeneration as part of our proposals on distributed energy. More details of our proposals are set out in chapter 3. We propose to place microgeneration projects in the same technology bands as their larger scale generation counterparts.

Next steps and timetable

5.3.61 Greater detail on all our RO related proposals is set out in the accompanying consultation document published alongside this White Paper. To provide a clear route map for developers and investors, we will take decisions on the future bands after the consultation and in advance of the necessary enabling legislation. These “bands” will then apply until 2013.

Results of the recent statutory consultation on the RO

5.3.62 Our recent consultation also included a series of more minor changes to the Renewables Obligation Order and these came into force on 1 April 2007. The detail is set out in the explanatory note accompanying the Order¹⁴⁸. These include specific de-regulatory measures which will:

- make it easier for small and micro-generators to seek support via the RO;
- allow generators to claim support for a wider range of biomass fuels as long as at least 90% of the total energy content is derived from biomass; and
- remove caps on co-firing energy crops.

5.3.63 As mentioned previously there are a range of other issues, beyond those related to the RO, which currently act as barriers to greater development of renewable energy. These issues are addressed in the following sections.

Planning

5.3.64 As already mentioned, planning is one of the most significant barriers to the deployment of renewables. For example, according to industry statistics, it takes an average period of 21 months for windfarms to secure planning consent under the Electricity Act regime¹⁴⁹.

5.3.65 In the Energy Review Report we therefore set out a series of initiatives and proposals aimed at reducing uncertainty and shortening the overall timescales from application to a final decision on consent. These were based on three underlying principles:

- improving the strategic (i.e. national policy) context against which individual planning decisions should be made;
- introducing more efficient inquiry procedures in the current consent regimes; and
- exploring options for more timely decision-making.

5.3.66 Each of the planning reforms in these areas is detailed in chapter 8 of this White Paper.

5.3.67 Recognising the particular difficulties faced by renewables in securing planning consent, the Government is also:

- underlining that applicants will no longer have to demonstrate either the overall need for renewable energy or for their particular proposal to be sited in a particular location;
- creating the expectation amongst applicants that any substantial new proposed developments would need to source a significant proportion of their energy supply from low carbon sources (including on and off-site renewables);
- encouraging planners to help create an attractive environment for innovation and in which the private sector can bring forward investment in renewable and low carbon technologies; and
- giving a clear steer to planning professionals and local authority decision-makers, that in considering applications they should look favourably on renewable energy developments.

¹⁴⁸ The Renewables Obligation Order 2006 (Amendment) Order 2007.

¹⁴⁹ BWEA Onshore Wind: Powering Ahead, March 2006.



5.3.68 In addition, new regulations that came into force in April 2007 to improve the efficiency of planning inquiries for electricity generation projects greater than 50MW should help large scale renewables projects seeking planning consent (see chapter 8 for more details).

5.3.69 In December 2006, we launched a consultation on a draft of the Planning Policy Statement (PPS) on Climate Change. It contains a number of key policies on renewables:

- It significantly strengthens the requirement on planners to recognise the national need for renewable technologies and other low carbon energy technologies.
- There is also a clear steer to planning professionals and local authority decision makers not to question the national need for renewables and other low carbon technologies, or to question the need for a particular project to be sited at a particular location.
- Substantial new developments should seek to source a significant proportion of their energy supply from low carbon sources (including on and off-site renewables).

5.3.70 We aim to publish the PPS on Climate Change at the earliest opportunity. We will publish guidance to accompany the Statement.

BOX 5.3.3 RENEWABLES STATEMENT OF NEED

We remain committed to the important role renewables has to play in helping the UK meet its energy policy goals. In this publication we are reiterating previous commitments we have made, not least in the 2003 Energy White Paper and Planning Policy Statement 22 on renewable energy (PPS22), on the importance of renewable generation and the supporting infrastructure. We intend this to reconfirm the UK Government policy context for planning and consent decisions on renewable generation projects.

As highlighted in the July 2006 *Energy Review Report*¹⁵⁰, the UK faces difficult challenges in meeting its energy policy goals. Renewable energy as a source of low carbon, indigenous electricity generation is central to reducing emissions and maintaining the reliability of our energy supplies at a time when our indigenous reserves of fossil fuels are declining more rapidly than expected. A regulatory environment that enables the development of appropriately sited renewable projects, and allows the UK to realise its extensive renewable resources, is vital if we are to make real progress towards our challenging goals.

New renewable projects may not always appear to convey any particular local benefit, but they provide crucial national benefits. Individual renewable projects are part of a growing proportion of low carbon generation that provides benefits shared by all communities both through reduced emissions and more diverse supplies of energy, which helps the reliability of our supplies. This factor is a material consideration to which all participants in the planning system should give significant weight when considering renewable proposals. These wider benefits are not always

¹⁵⁰ <http://www.dti.gov.uk/energy/review/>

BOX 5.3.3 CONTINUED

immediately visible to the specific locality in which the project is sited. However, the benefits to society and the wider economy as a whole are significant and this must be reflected in the weight given to these considerations by decision makers in reaching their decisions.

If we are to maintain a rigorous planning system that does not disincentivise investment in renewable generation, it must also enable decisions to be taken in reasonable time. Decision makers should ensure that planning applications for renewable energy developments are dealt with expeditiously while addressing the relevant issues.

5.3.71 The Energy Review Report also sets out a commitment to a reform of the planning system for major energy infrastructure projects in the longer term. These reforms will cover all large onshore renewable projects with a capacity of greater than 50MW and offshore with capacity greater than 100MW. We expect them to bring real benefits with an expectation that the decision making phase (including inquiry) will take no longer than nine months except in particularly difficult circumstances. The details of the reforms are discussed in chapter 8, and in the planning White Paper 2007, *Planning for a Sustainable Future*¹⁵¹.

5.3.72 Taken together, we believe this package of proposals will increase the speed and quality of decision-making on existing and future renewable projects reducing costs and risks for developers and uncertainty for local communities.

Improving grid access for renewable generation

Context

5.3.73 As already mentioned in section 5.2, in Great Britain, electricity is transported over high and low voltage power lines. The transmission network (high voltage), on the whole, receives electricity from large power stations which in turn enters, via transformers, the low voltage distribution system. Most consumers receive their electricity from the low voltage network.

5.3.74 National Grid (NGET) owns the England and Wales transmission system, with Scottish Power and Scottish and Southern Energy each owning a part of the transmission system in Scotland. As transmission system owners, these companies are responsible for building and maintaining safe and efficient networks and are regulated by Ofgem. NGET also has the responsibility of overseeing and managing the flow of electricity across the whole GB transmission network, including the elements owned and maintained by Scottish Power and Scottish and Southern Energy. In this role, NGET is known as the transmission system operator. NGET is also required to co-ordinate the process of making connection offers to prospective system users. This involves having in place a series of rules for achieving grid



connection and developing those rules as necessary with the aim of operating the system in an economic and efficient manner (as required by its transmission licence).

5.3.75 To reach our aspiration of 20% of electricity supplied from renewable generation by 2020, approximately 20GW of renewable capacity would need to be connected to the GB transmission system. Our aim is to connect new renewable generating capacity to the electricity network as quickly and as cost-effectively as possible. The majority of the new renewable generation is likely to be variable onshore and offshore wind. In the longer term, this implies the need for an electricity transmission system that does not attempt to accommodate all generation simultaneously, but where transmission access is shared amongst different forms of generation. Such a system would mean that the transmission system could accommodate an increased amount of generating capacity for a given amount of transmission capacity. The current technical, commercial and regulatory framework for transmission access will need to change to facilitate the cost-effective integration of more diverse generation technologies into the electricity system.

5.3.76 The energy generated from wind is more variable than conventional generation and can only make a limited contribution to overall system security. However, even at relatively high degrees of renewable penetration (e.g. 20%) analysis suggests that the additional system balancing and system margin costs associated with this variability are relatively low.¹⁵²

5.3.77 We are making progress in connecting new renewables projects. Since January 2006 around 630MW of renewable generation capacity has been connected to the grid helping to reduce carbon emissions.¹⁵³

5.3.78 Investment in essential infrastructure is underway with further significant investment already agreed. For example:

- Ofgem has agreed £560 million for essential transmission network investment to allow low carbon generation in Scotland and Northern England to connect to the grid. This investment programme is already underway and is expected to be completed, subject to planning consent, by around 2012.
- Ofgem and the Great Britain transmission licensees¹⁵⁴ have agreed a five-year Transmission Price Control, commencing on 1 April 2007 that allows for a doubling in real terms of electricity transmission network capital expenditure compared to the previous five-year price control period. This is additional investment of some £4billion at 2006/07 prices GB wide, with the real increase in Scotland equivalent to around 250%.

5.3.79 The price control proposals also allow the transmission companies flexibility under certain conditions to make further investments automatically without the need to reopen the entire price control review. This mechanism will be of particular benefit to renewable generation.

¹⁵² <http://www.ukerc.ac.uk/content/view/258/852>

¹⁵³ Renewable Energy Statistics Database, http://www.restats.org.k/2010_target.htm

¹⁵⁴ The three transmission licence holders are Scottish Power and Scottish & Southern Energy in Scotland and NGET in England and Wales.

5.3.80 In the recent Transmission Price Control Review Ofgem raised the possibility of a competitive approach for very large extensions to the transmission network, in particular the connections for Shetland, Orkney and the Western Isles. In other words, companies other than the three current owners of GB transmission assets would be permitted to compete for licences to own and maintain these new parts of the transmission network. This may ultimately lead to more competitive and innovative connection solutions for the Scottish Islands. Ofgem intends to consult further on this issue during 2007.

The challenges to improving renewable grid connection

5.3.81 Although recent progress is encouraging, a number of key challenges to speeding up the rate of connection of renewable generation remain.

These are:

- the need to manage more efficiently the queue of developers waiting for grid connection;
- the need for reform to the arrangements for access of renewable generation to the transmission grid;
- ensuring the technical standards for the grid do not disproportionately burden renewable generators; and
- ensuring that in the longer-term we have a framework that continues to meet the grid-related challenges associated with an increasing proportion of renewable generation.

5.3.82 Two programmes of work will be taken forward: the first to meet the immediate challenges of managing the connection queue, access reform and reviewing technical standards; and the second to set a longer-term strategic direction.

Action in the short term

Managing the GB Queue

5.3.83 The GB Queue (sometimes called the BETTA Queue) refers to projects in Scotland that applied for connection ahead of the introduction of the single GB electricity trading and transmission arrangements (BETTA) in 2005. These projects benefited from transitional arrangements allowing them to be dealt with in an order determined by the date of application. Consequently, projects in Scotland now hold connection offers that do not necessarily reflect their actual state of progress. For example, projects with planning consent are behind projects that have not yet applied for consent, while other projects hold connection offers in excess of the capacity for which they are seeking planning consent. Examples of connection congestion are now being seen in England and Wales as well as in Scotland.

5.3.84 We need a robust approach to maximising connections for the most viable, closer to operation renewables projects.

5.3.85 NGET has now issued a consultative open letter that seeks views from market participants on approaches to improving the management of the queue, including steps that NGET plans to take in the near future. The aim is to ensure that the most efficient use is made of transmission capacity by



freeing up connection opportunities and making them available to those best able to use them¹⁵⁵.

5.3.86 The approach proposed by NGET includes taking a more robust approach to contract management. NGET will do this, for example, by more closely monitoring and managing project milestones in connection agreements to ensure projects are on track, and by introducing an amnesty period to allow projects to seek certain changes with no consequences. NGET is also consulting with industry on approaches to allocating the connection opportunities made available through these measures. The consultation closed on 26 March 2007. NGET has now published its initial conclusions and expects to publish final conclusions by the end of May 2007.

Access Reform

5.3.87 Access to the transmission network is governed by the Connection and Use of System Code (CUSC), a contractual framework for connection to, and use of, the high voltage transmission system. This is overseen by industry's own governance arrangements. Ofgem are responsible for making decisions on any modifications proposed through these governance processes. NGET currently offers standard access products (commercial arrangements which offer varying degrees of certainty as to the level of access to the network) which have been developed with traditional forms of electricity generation in mind. The development of more flexible access products may help to connect more renewable generation earlier.

5.3.88 Any changes to the arrangements for grid connection need to take into account the relative costs and benefits to consumers of connecting additional generating capacity. This is especially true in constrained parts of the network where there is more generating capacity than the transmission network is able to accommodate.

5.3.89 Whilst the £560 million, already agreed for essential network investment to connect low carbon generation in Scotland and Northern England to the rest of England, and the recently agreed five-year Transmission Price Control Review, are welcome, this investment will take several years to complete.

5.3.90 In the meantime, some renewable generators may be restricted from gaining access to the transmission network due to the volume of new generators of all types seeking access to remote capacity constrained areas of the transmission network. For example, there are currently approximately 12.3GW of projects seeking connection in Scotland, and around 9.3GW (including renewable and gas-fired generation) in Wales. Reform of access arrangements is, therefore, an important element in promoting early access to the network for renewable generators.

5.3.91 Important work is already underway:

- An industry working group, co-ordinated by Ofgem, reported on approaches to improving grid access in April 2006¹⁵⁶. As a consequence

155 <http://www.nationalgrid.com/NR/rdonlyres/54E69BF1-2421-4C81-9A34-BB9977965174/15473/IndustryConsultation1.pdf>

156 A framework for considering reforms to how generators gain access to the GB electricity transmission system: a report by the Access Reform Options Development Group; April 2006; available at <http://www.ofgem.gov.uk>

NGET has introduced interim alternative arrangements to the Final Sums Liability financial securities regime that has alleviated some of the significant concerns previously raised by renewable developers. The new arrangements provide a greater degree of certainty for developers about the extent of the financial liabilities they commit to when their project triggers reinforcement work on other parts of the transmission network.

- National Grid has now proposed an enduring approach to financial securities for grid reinforcement works which, through a non-refundable commitment when a connection offer is accepted, should discourage speculative projects. This should create space for more viable projects to move forward more quickly. The Government believes that this approach will be most effective where the new rules are applied on a mandatory basis to existing and future generators. However, the ultimate decision will be for Ofgem, in response to proposals from NGET and industry.

5.3.92 NGET, supported by the DTI, the transmission licensees and industry, will continue to take forward a programme of work through current industry governance arrangements to deliver improved renewable generation access arrangements in the immediate term including:

- making further progress on developing access products that should allow more renewables projects to connect earlier. These access products will however need to strike the right balance between supporting access to finance for developers and the overall costs of system operation;
- a review of the operational measures to increase the capacity and utilisation of existing transmission infrastructure. This will include consideration of innovative approaches to network management and operation. Findings will be presented in a report to Ofgem highlighting geographical areas where there may be scope to connect additional generation capacity but using the existing infrastructure;
- consideration of the costs and benefits of a “risk-based” approach to the management of connection offers by anticipating the rate at which projects are likely to withdraw before taking up the connection offer. Successful application of this approach could allow some projects to connect earlier than might otherwise be possible; and
- work with Ofgem and industry to address any regulatory constraints acting as a barrier to renewables access.

5.3.93 Key practical factors to be considered in developing these solutions are the obligations upon NGET as the Great Britain System Operator to ensure that it does not discriminate between generators, that it maintains required security standards, and operates the system economically and effectively. Proposals for change will be brought forward through industry governance arrangements in the usual way and considered by Ofgem.

5.3.94 Ofgem will report to the Gas and Electricity Markets Authority (GEMA) and the Secretary of State for Trade and Industry on progress on all these issues in September 2007, enabling decisions to be taken by Ofgem by the end of 2007.



Setting the right technical standards

5.3.95 The technical standards that generators must conform to, and to which grid reinforcements are delivered, are set out in the Supply Quality and Security Standards (SQSS) and the Grid Code. The SQSS and the Code are the responsibility of NGET as the system operator. These standards need to be set at the right level to support the connection of renewable generation, at least cost to consumers and with no reduction in the very high levels of system security that Great Britain currently enjoys.

5.3.96 SQSS need to reflect the different demands that variable generation places on the network and avoid “over-engineered” solutions that may increase costs and cause delays disproportionately for renewable generation. Research for the DTI by the Centre for Distributed Generation and Sustainable Energy (DGSE) indicates that the current methodology for determining the transmission capacity required to accommodate wind generation may need refining¹⁵⁷.

5.3.97 NGET will complete an inclusive and transparent review of SQSS in order to ensure that they reflect the particular characteristics of renewable generation. Key considerations will be the appropriate planning standard in order to maintain system security and the appropriate level of additional investment needed to ensure that system operation remains economic and efficient. The review is expected to be completed by the end of 2007.

BOX 5.3.4 CENTRE FOR DISTRIBUTED GENERATION AND SUSTAINABLE ENERGY (DGSE)

Three years ago, the DTI established the DGSE to address some of the grid-related implications of a sustainable future. The Centre has undertaken a number of important projects in this area, including work to identify the relationship between variable generation and transmission investment and to investigate the future dynamic performance of the electricity system with a high penetration of wind.

Additional funding of £1 million has now been allocated to expand the Centre’s activities. Specifically, the Centre is currently undertaking work associated with the integration of wind generation. This will include the development of a better understanding of the impacts of extreme weather on the availability of wind generation; the impact of the likely distribution of wind generation in the UK; how to minimise the impact of variability by the use of storage and demand side measures; and the development of a comprehensive, consistent and publicly available set of wind data to support future studies.

¹⁵⁷ *Transmission Investment, Access and Pricing in Systems with Wind Generation, February 2007*
<http://www.sedg.ac.uk>

Action for the medium and long term

5.3.98 Ofgem and the DTI supported by NGET, the other transmission licensees and industry, will review the present technical, commercial and regulatory framework for the delivery of new transmission infrastructure and the management of the grid to ensure that they remain fit for purpose as the proportion of renewable generation on the system grows. The review will set out proposals for changes to the framework in the medium and long term, consistent with the Government's energy policy goals and better regulation agenda, which will better support the connection of renewable generation to the grid.

5.3.99 This will include consideration of:

- the clarification of transmission access rights;
- the ways in which access to the network can best be shared between different forms of generation, taking into account the access reform work currently underway;
- whether the current approach to transmission system planning and operation is likely to give the most efficient outcome, drawing on the work NGET has already done;
- consideration of the extent to which the existing mechanisms for system and energy balancing remain appropriate in incentivising the timely connection (and disconnection) of generation. This is an important part of the longer term vision of having a flexible system so that when electricity generated from renewable sources is available (e.g. when the wind is blowing) it can efficiently and cost-effectively replace electricity from fossil fuel fired forms of generation. This will include consideration of the role constraint costs play in the transmission system; and
- a review of relevant industry governance arrangements to ensure that they continue to deliver timely, strategically-driven changes to the framework for access to the grid that are consistent with the evolving UK electricity generation mix.

5.3.100 Ofgem and the DTI will provide an interim report to GEMA and the Secretary of State for Trade and Industry in December 2007, and a final report setting out recommendations and a delivery plan in May 2008. The interim report will include consideration of the case for amending primary and secondary legislation.

The framework for offshore renewables

5.3.101 Our proposals on banding the renewables obligation, improving the planning consenting process and making it easier to connect renewables projects to the grid will help both onshore and offshore renewables projects. However, the Government also recognises that there are issues relating to planning consent, decommissioning and grid connection that are specific to offshore renewables.

5.3.102 We believe it is important to provide a long-term market for offshore renewables and for this we need long-term clarity on offshore development rights. Working with the Crown Estate, which owns the rights to the development of the seabed, we have run two competitions for the development rights for offshore wind farms. Our aim is to provide regular



opportunities to bid for offshore projects as well as speeding the consenting process. We will publish proposals for further offshore renewables developments by the end of 2007. Further calls for development will be preceded by Strategic Environmental Assessments (SEAs)¹⁵⁸ and may also require Appropriate Assessments¹⁵⁹, which together will take a minimum of 1-2 years depending on areas of interest for possible development. Subject to the results of the SEAs it is likely that a further tendering process for offshore renewables leases would conclude at the earliest in 2010. This process will be developed in a way that is consistent with the Government's intentions to introduce marine planning, as set out in the Government's Marine Bill White Paper, and reforms in the Planning White Paper.

5.3.103 In addition, by introducing new rules for planning inquiries to consider applications under the Electricity Act, we have for the first time included specific offshore provisions that will allow efficient offshore inquiries. These will build on the approach taken in the Electricity (Offshore Generation Stations) (Applications for Consent) Regulations 2006.

5.3.104 We have also put in place a statutory decommissioning regime to ensure we achieve an appropriate balance between exploiting our offshore renewable resources and safeguarding the marine environment. We will explore ways of strengthening that regime to ensure that funds set aside for decommissioning are secure for that purpose (in the event of insolvency) and which will make it easier for Government to recover the costs of decommissioning in the event of operator default.

Offshore grid issues

5.3.105 A number of smaller Round 1 offshore wind farms are already connected to the onshore grid via low voltage connections. However, the larger Round 2 projects will connect to shore via high voltage or transmission systems¹⁶⁰. In the Government Response of March 2006 to the joint DTI/Ofgem consultation on the regulation of offshore electricity transmission, the Government concluded that the best system of regulation for offshore electricity transmission was by a licensed price control approach, similar to onshore.

5.3.106 Delivering cost-effective and timely connections from offshore projects to the onshore GB electricity transmission and distribution networks is crucial to the exploitation of this potential offshore resource. Certainty about how the grid connection costs¹⁶¹ will be funded, and the regulation that controls them, is key for Round 1 and Round 2 developers.

5.3.107 Offshore developers also require clarity about interim arrangements to enable them to proceed with their projects while the details of the new regime are worked up.

¹⁵⁸ European Directive 2001/42/EC on the assessment of the effects on the environment of certain plans and programmes.

¹⁵⁹ Birds Directive: Council Directive 79/409/EC on the conservation of wild birds and Habitats Directive: Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

¹⁶⁰ All references in this section to "high voltage" or transmission are to 132kV or more (i.e. the definition applicable to relevant offshore lines when s.180 Energy Act 2004 is commenced).

¹⁶¹ We estimate that grid connections are likely to form up to 10-15% of capital costs for projects.

5.3.108 Since the decision in March 2006, a significant amount of work has been undertaken by the DTI and Ofgem, in conjunction with the industry, to deliver the new offshore transmission regime.

Progress

5.3.109 In April 2006 Ofgem published a scoping document inviting comments on the proposed work plan for implementation of the offshore transmission regime.

5.3.110 In May 2006 Ofgem and the DTI set up the Offshore Transmission Expert Group (OTEG) to provide technical advice and information necessary to developing the new regime.

5.3.111 In August 2006 the Energy Minister announced that NGET's role as Great Britain System Operator (GBSO) will be extended offshore. NGET will be the system operator for both onshore and offshore parts of the transmission system and, until the relevant provisions of the Energy Act 2004 are commenced and appropriate modifications made to NGET's licence for these purposes, is acting as offshore GBSO designate in the context of helping to develop the new offshore transmission regime.

5.3.112 In November 2006 the DTI and Ofgem published for consultation the options being considered for the next significant stage in the process of establishing a new offshore transmission regime; that is the model for awarding offshore transmission licences. The consultation closed on 8 January 2007. In March 2007 the Government announced it had concluded that a competitive, non-exclusive approach to awarding offshore transmission licences is the appropriate model to follow offshore. We believe this method of licensing will achieve the lowest costs of connection for offshore generators and consumers, and enable significant amounts of offshore generation to connect to the onshore grid.

5.3.113 The Government has also listened to offshore developers' concerns about the need for interim modifications to enable them to proceed with their projects before new offshore Transmission Owners are licensed to operate offshore. The Government response and an accompanying Ofgem Scoping Document contained further details on how this would be achieved.

5.3.114 The DTI and Ofgem are proceeding with the next phase of the project to make the appropriate modifications to transmission licences, codes and agreements for the purposes of offshore transmission. A further policy statement will follow in July 2007.

5.3.115 In November 2006 the Government also gave notice of and consulted on a proposal to grant a class exemption from the requirement to



hold a licence for offshore distributors. The Electricity (Class Exemptions from the Requirement for a Licence) (Amendment) Order 2007 came into force on 6 April 2007. This lighter touch approach to low voltage lines offshore will help smaller wind farms to operate within the regulatory framework, and also help any future wave and tidal projects that wish to connect to shore at this voltage.

5.3.116 And in December 2006 the Government consulted on the minimum security standards which should apply to offshore transmission networks. That consultation has closed and the Government announced in April 2007 its decision that it is appropriate to have a lower security standard offshore. Further consultation on the modifications required to the GB SQSS resulting from this decision will be taken forward in tandem with the offshore transmission licensing model.

5.3.117 Taken together, we believe these decisions give developers clarity about the fundamentals of the regime to allow them to move their projects forward prior to the final regime going live. Setting these high-level decisions will also allow us, in partnership with Ofgem – and in consultation with industry – to progress the technical drafting of appropriate modifications to licences and codes and agreements throughout 2007 with the aim of implementing the new offshore regime in 2008 (subject to commencement of the relevant statutory provisions). Government and Ofgem will work with developers before the final regime is in place to consider issues which arise relevant to investment decisions, with the aim of enabling investment in offshore wind projects to continue.

Renewables Summary of Measures

We are introducing a series of measures to strengthen delivery of renewables generation. These include:

Strengthening and modifying the Renewables Obligation by:

- **extending the Renewables Obligation (RO) up to 20% on a headroom basis;**
- **retaining the buy-out price link to the RPI;**
- **introducing banding of the RO to target support at the needs of groups of individual technologies and promote wider deployment;**
- **lifting the current limits on the amount of co-firing generation that qualifies for support under the RO; and**
- **putting in place appropriate grandfathering provisions, meaning that most existing projects will continue to receive the current number of Renewable Obligation Certificates for each MWh of electricity they produce, providing certainty for existing investments.**

Improving the planning consenting process for on and offshore renewables by:

- **delivering on the broader planning proposals set out in the 2006 Energy Review Report and in the 2007 Planning White Paper (more detail in chapter 8 on planning);**
- **publishing a statement of need for renewables (as in Box 5.3.3). This emphasises the importance of renewables in helping us to meet the UK's climate change and energy policy goals, and is a material consideration in all planning inquiries;**
- **building on this statement of need, and the existing Planning Policy Statement (PPS)22 on renewables, by putting renewables generation at the centre of the proposed Planning Policy Statement (PPS) on Climate Change;**
- **consulting on proposals to improve the resilience of overhead power networks. These are designed to strike a better balance between a flexible approach for minor upgrades and the need for a new consent for major upgrades, a particularly important issue for the development of renewables; and**
- **working on strategic assessments which will underpin future development rounds for offshore wind.**

Improving Renewables Grid Connection onshore and offshore by:

- **working intensively with NGET, Ofgem and industry to implement changes that will help bring forward connection opportunities for the most viable renewable projects;**
- **working with Ofgem and NGET to consider, and where appropriate implement, reforms to the rules relating to grid access in order to improve the opportunities for more renewable projects to connect earlier; and**
- **establishing an offshore transmission regime that enables offshore generators to connect to the onshore grid in an economical, efficient and timely manner. This regime includes interim arrangements enabling projects to proceed before new offshore Transmission Owners are licensed to operate offshore.**



Section 5.4 – Cleaner Coal and Carbon Capture and Storage for Fossil Fuels

Coal will continue to play a significant role in global electricity generation for the foreseeable future, partly because it is the most abundant global fossil fuel but also because it brings security of supply benefits. For example, coal-fired power generation is a flexible electricity source that can respond effectively to changing levels of demand. It also helps to maintain a diverse energy mix.

5.4.1 However, coal is more carbon intensive than oil or gas. On current policies, world carbon dioxide emissions from electricity generation are projected to increase by two thirds over the period 2004-2030 and much of this is driven by the continued use of coal. China and India alone account for 60%¹⁶² of this increase in emissions, with China building 105GW of new coal-fired power capacity in 2006 (at an average rate of around one new 1GW power station every four days)¹⁶³.

5.4.2 Since investments in electricity generation typically have a long lead time, including commercial scale demonstrations, there is a premium on early action. A clear, demonstrated affordable pathway to the less carbon intensive use of fossil fuel would significantly boost the confidence of coal reliant countries, such as China and India, in being involved in a long-term international climate change framework to reduce emissions. The global challenge is therefore how to accelerate the deployment of technologies that allow us to continue to benefit from coal-fired power generation while reducing greenhouse gas emissions.

The options for lower carbon fossil fuel-fired power generation

5.4.3 There are three principal methods for reducing carbon emissions from fossil fuel fired power generation:

- improving coal-fired power station efficiency;
- co-firing coal with biomass; and
- carbon capture and storage (CCS).

¹⁶² IEA, *World Energy Outlook*, 2006.

¹⁶³ According to the International Energy Agency, 2007



Improving power station efficiency

5.4.4 Currently there is around 28GW of coal-fired power capacity in the UK. Around 8GW of these power stations will close by 2016 because of the requirements of the Large Combustion Plants Directive (LCPD). The LCPD restricts emissions of sulphur dioxide and nitrous oxides from coal power stations and other large-scale installations but places no restrictions on carbon dioxide emissions. Developers of new power stations are using advanced boilers, improved turbines and gasifiers which mean that less fuel is required to be used to generate power. This increased efficiency of coal power stations reduces emissions by up to 20% compared with less efficient power stations. Some developers are also using these technologies to retrofit their existing power stations.

5.4.5 The Government recognises that there is potential for further long-term improvements in cleaner coal technology through technical innovation. This is why, in addition to long-standing support for research and development, further funding has been made available through the Carbon Abatement Technology (CAT) Programme¹⁶⁴. The CAT Programme was launched in June 2005, with the first call for proposals launched in September 2006. This first call focused on pre-commercial demonstration of key components and systems to support carbon abatement technologies. The successful proposals will be awarded contracts shortly. The CAT strategy has also emphasised the need for international collaboration on the development of cleaner coal technologies. Our international low carbon technology strategy is described in chapter 1.

Co-firing coal with biomass

5.4.6 Efficient coal power stations can combine their fuel with biomass and thereby decrease emissions by about 10%. A number of power stations have now been co-firing for several years and in doing so those companies have benefited from support under the Renewables Obligation. As a consequence co-firing coal with biomass is becoming a near-market commercially viable option for reducing carbon emissions for existing power stations¹⁶⁵.

5.4.7 The Biomass Strategy published alongside this White Paper has examined how cost-effective co-firing is as an option for achieving carbon emissions savings, compared with the alternative uses for biomass such as heating, dedicated biomass power generation, the production of transport biofuels and non-energy uses. The Biomass Strategy focuses not only on how biomass should best be used in low carbon energy production but also on optimising the supply of biomass in a sustainable way. It concludes that a generally more cost-effective use of biomass is for heating, while recognising that co-firing makes a valuable contribution to meeting the UK's renewable energy and emissions reduction targets. The conclusions of the Strategy have informed the recommendations on banding of the Renewables Obligation in section 5.3.

¹⁶⁴ <http://www.hfccat-demo.org>

¹⁶⁵ The issue of continued support for co-firing was examined in the Renewables Consultation that followed the Energy Review Report (see chapter 5.3 of this White Paper). The consultation concluded that, given that co-firing of biomass is now becoming a more established commercial practice, the support it receives from the Renewables Obligation will be reduced alongside the removal of the cap. The exact level of support will be determined following a further consultation being launched alongside this White Paper, <http://www.dti.gov.uk/energy/review/implementation/page31829.html>

5.4.8 As with cleaner coal, the Government believes there is scope to improve co-firing operations in existing power stations through the development of advanced co-firing options. Development projects of this kind are supported by Government through R&D and through the International Energy Agency.

Carbon capture and storage (CCS)

5.4.9 CCS involves capturing the carbon dioxide emitted when burning fossil fuels, transporting it and storing it in secure spaces such as geological formations, including old oil and gas fields and aquifers (natural underground reservoirs) under the seabed. Carbon dioxide capture technologies are based on three generic approaches: pre-combustion, post-combustion and oxyfuel¹⁶⁶ and can be applied to coal or gas-fired power generation. CCS represents a major technological challenge, and there are also cost uncertainties and regulatory issues that still need to be resolved. As yet, no commercial-scale CCS power station has been developed in any country, although some key elements of the individual stages of the process have been demonstrated.

5.4.10 While there is a wide range of estimates for the cost of electricity produced by CCS power stations, it is likely that CCS would not be commercially viable unless costs fell substantially relative to the cost of other cheaper forms of generation, or unless the carbon price rose sufficiently to provide a larger financial incentive. Given the potential of this technology to meet both our security of supply and climate change policy goals, the UK and the EU are working towards commercial-scale demonstration and deployment of CCS, in order to bring down the costs and to help make the technology commercially viable.

Carbon capture and storage international context

5.4.11 It is in our own vital interest that the technologies necessary to make coal low carbon are developed and deployed as rapidly as possible, since fossil fuel generation will remain a significant part of the global energy mix (on the Governments' present policies meeting almost 70% of global electricity demand by 2030¹⁶⁷). The Government believes that the development and wide-scale deployment of CCS is therefore important for our climate change and security of supply objectives. CCS has the potential to reduce carbon dioxide emissions from fossil fuel power stations by as much as 90%¹⁶⁸. The Stern Review¹⁶⁹ highlighted the strategic role that CCS technology could play globally to lower carbon emissions, with the potential to contribute up to 28%¹⁷⁰ of global carbon dioxide mitigation by 2050, particularly in fast-growing economies with rising fossil fuel consumption such as China and India.

166 Detail of technology design and transport and storage options can be found in the following documents:
DTI: *A Strategy for Developing Carbon Abatement Technologies for Fossil Fuel Use*, 2005.
(<http://www.dti.gov.uk/files/file19827.pdf>); Analysis of carbon capture and storage cost-supply curves for the UK, Poyry, 2007(<http://www.dti.gov.uk/files/file36782.pdf>)

167 World Energy Outlook 2006.

168 Intergovernmental Panel on Climate Change (IPCC).

169 The Stern Review – The Economics of Climate Change. Nicholas Stern, 2006.

170 International Energy Agency, *Energy Technologies Perspectives*, 2006.



5.4.12 In order to deploy CCS in these countries the technology needs to be demonstrated on a commercial scale. Developing countries strongly indicate it is for developed countries to show leadership and to prove the validity of the technology, firm up costs and reduce technical risks.

5.4.13 The European Council¹⁷¹ has agreed that Europe should aim for all new fossil fuel power generation built beyond 2020 to be equipped with CCS, subject to the technology being technically and economically feasible. It also recommended that the Commission work towards a series of up to 12 CCS demonstrations by 2015. We welcome the Commission's ambition in this area and we support their suggestion that they make further recommendations within the next couple of years, including further work on technical and economic viability.

5.4.14 To facilitate the development of CCS in the UK and internationally we set out in more detail in the sub-sections below how the UK is:

- progressing our understanding of the barriers to CCS deployment;
- launching a competition for demonstration of CCS on power generation in 2007 (when operational, this will make the UK a world leader in this globally important technology); and
- clarifying and developing the regulatory frameworks required (nationally and internationally). Progress has also been made on a range of international initiatives as set out in Box 5.4.1.

BOX 5.4.1 INTERNATIONAL OUTREACH AND COLLABORATIVE INITIATIVES

The technical, economic, environmental and social aspects of CCS are currently attracting worldwide interest, with over 20 countries pursuing activities and programmes. A number of international initiatives have also been established in the past few years, including the five CCS initiatives which the UK began under its G8 Presidency in the G8 Gleneagles Plan of Action. These include work on the definition of capture-ready power stations, clean coal use in China and the "Early Opportunities for CCS" workshops.

The Carbon Sequestration Leadership Forum is an organisation made up of 22 countries to facilitate the development and deployment of improved cost-effective technologies for CCS. The UK's most recent contribution to this was writing the public outreach strategy which will enable the potential benefits of CCS to be communicated to a much wider audience.

The UK and Norway have been collaborating for 18 months on how we should manage the transportation and storage of carbon dioxide in the North Sea. In December 2005 Energy Ministers from both countries signed an agreement to establish a North Sea Basin Task Force made up of both industry and Government personnel to look into matters of common

171 <http://www.consilium.europa.eu/uedocs/cms-data/docs/pressData/en/ec/93135.pdf>

BOX 5.4.1 CONTINUED

interest. This Task Force is currently overseeing two key pieces of work examining a compatible regulatory regime and a common carbon dioxide transport infrastructure. The report on transport infrastructure will be completed in July 2007.

The UK has also been very active in the EU Technology Platform for Zero Emissions Fossil Fuel Power Plant. At both industry and government levels we have been taking a leading role in developing strategies for deployment and research of CCS technologies on a European scale. The Technology Platform's aim is to have commercially viable CCS as a technology of choice by 2020.

There are a number of proposed cleaner fossil fuels and CCS projects that European consortia are invited to apply for under the first call for the Seventh Research Framework Programme (FP7). The call was launched on 22 December 2006 and will close in May 2007.

The UK initiated and is leading a joint EU-China project to build a commercially viable near-zero emissions coal (NZE) power station in China. Work on Phase 1 of NZE is now underway, to identify early demonstration opportunities of CCS in China. Further details on NZE are provided in chapter 1. The Government is continuing to work with the US through an Implementing Arrangement on Fossil Energy research and through a Memorandum of Understanding with the Ministry of Science and Technology in China on low carbon technologies.

The Government is also starting collaboration with India to develop understanding of CCS. The Government supported a CCS research conference in India in January 2007.

Carbon capture and storage in the UK

5.4.15 The demonstration of commercial-scale CCS on power generation in the UK could enable the technology to be proven and facilitate a better understanding of the costs. In turn this could contribute to the deployment of CCS on a national and international basis.

5.4.16 The 2006 Budget launched a consultation on the barriers to wide-scale commercial deployment of CCS in the UK and the potential role of economic incentives in addressing those barriers, the responses to which were published in December 2006¹⁷². The Government also set up a Task Force to examine the regulatory framework that will facilitate CCS. The Task Force is clarifying existing UK regulation and its application and is identifying the need for new regulation, including:

- The licensing of carbon dioxide storage sites and activities; and
- The decommissioning and long-term liabilities associated with storage facilities.

¹⁷² http://www.hm-treasury.gov.uk/pre_budget_report/prebud_pbr06/other_docs/prebud_pbr06_carbonresponses.cfm



5.4.17 The CAT Programme included £25 million of capital grants (increased to £35 million in PBR 2005) for the pilot demonstration of key CCS components, to act as a bridge between R&D and commercial-scale demonstration.

UK carbon capture and storage demonstration

5.4.18 In the 2007 Budget the Government announced that it will launch a competition to develop the UK's first commercial-scale demonstration of CCS. When operational early in the next decade, this will make the UK a world leader in this globally important new technology.

5.4.19 This decision was informed by the analysis from consulting engineers. The engineers¹⁷³ were appointed, following announcement in the Pre-Budget Report 2006, to ensure that the Government's understanding of the costs of a CCS power station based in the UK was robust. Their findings confirmed that the costs of a commercial-scale demonstration project are likely to be higher than those of subsequent CCS power stations given that this will be the first time the individual processes are integrated and tested at scale. Companies would not bring forward a commercial-scale demonstration power station without additional support because of the uncertain costs of full-scale deployment. Even when CCS is included in the EU Emissions Trading Scheme (see CCS: regulatory progress section below), it is not clear that the carbon price would be high enough to make the cost of a demonstration project economic.

5.4.20 There is a strong case for the UK demonstration of CCS on power generation. The UK is well served with potential carbon dioxide storage sites, particularly under the seabed in the North Sea. Providing financial support and hosting UK-based CCS demonstration will help the Government meet its aims for climate change and wider energy policy goals by:

- reducing risks and demonstrating costs of CCS, and taking the first step towards longer term cost reductions and the deployment of CCS on a wide scale nationally and more importantly, internationally;
- reinforcing the UK's international leadership on climate change by investing in CCS technology that in time has the potential to make substantial reductions in global carbon dioxide emissions;
- helping to gain global agreement for a more ambitious drive to reduce emissions by demonstrating that CCS can safely deliver large reductions in emissions, and the extent to which it is affordable and reliable;
- giving UK business a lead in the design, construction and operation of CCS technologies. This will have the advantage of helping to build the skills base and demonstrate supply chains in the UK building on the existing experience and expertise in the UK of operating in the UK Continental Shelf. This should help put UK business in a stronger position to take advantage of future CCS investment opportunities; and
- enabling the UK to develop a comprehensive regulatory framework for CCS.

5.4.21 The demonstration in the UK has been approached in three stages:

- Stage 1 – The Government has completed the analysis of the full economic cost of a first-of-a-kind CCS power station and is working on the options for delivery of necessary support.

¹⁷³ PB Power was appointed in January 2007.

- Stage 2 – Following the 2007 Budget announcement, the Government is engaged in designing a competition framework for the UK CCS demonstration. Our intention is to launch the competition in November 2007. We recognise that individual companies will incur significant costs to participate in the competition. The Government is therefore committed to regular progress meetings with project developers and publication of competition details as they are decided. We will hold early discussions on the timetable for the competition including the relative merits of a one or two phase competition. The criteria against which proposals will be assessed are likely to include the need for any project proposal to:
 - be located in the UK;
 - cover the full chain of CCS technology on a commercial scale power station (capture, transport and storage);
 - be based on sound engineering design (reliable and safe) underpinned by a full front-end engineering and design study;
 - set out the quantum of financial support requested;
 - be at least 300MW, and capture and store around 90% of the carbon dioxide and thereby contribute at least an additional 0.25 Mt/yr of carbon savings to the UK's domestic abatement targets (relative to a gas-fired power station of equivalent size without CCS);
 - start demonstrating the full chain of CCS at some point between 2011 and 2014;
 - address its contribution to the longer term potential of CCS in the UK, (for example, through the potential of shared infrastructure) and to the international development of CCS; and
 - be supported by a creditworthy developer entity.
- Stage 3 will cover the competition process itself, including the competition launch and the assessment of the proposals.

5.4.22 Since demonstrations are so costly there is general acceptance that individual countries will only be able to host a limited number and that to obtain maximum benefit information will need to be shared. This was recognised in the Stern Review, which called for greater international co-operation to accelerate technological innovation and diffusion of information to reduce the costs. The successful demonstration of CCS in the UK should contribute to the eventual deployment of this chain of technologies in the UK, Europe and internationally.

5.4.23 As part of the competition, project developers will therefore also be expected to include proposals for knowledge and know-how transfer to third parties. These will need to be sufficient to meet the Government's aims to encourage the wider deployment of CCS in the UK, Europe and internationally, particularly in countries with significant future energy needs such as China and India. The UK is working with the Commission to ensure that the development of CCS in the UK fits with the objective agreed at the European Council in March 2007 to have in place up to 12 CCS demonstration projects in Europe by 2015.

5.4.24 Any successful demonstration will have to satisfy regulatory, planning and environmental requirements at the time of award. Project developers will therefore be expected to work closely with the Government to ensure we develop a suitable regulatory framework for CCS. We will also be consulting more widely on these regulations.



Carbon capture and storage: regulatory progress

5.4.25 We have made substantial progress on regulatory frameworks for the implementation of CCS. In particular:

- In November 2006, after two years work led by the UK, the global marine environment convention, the 1996 Protocol to the London Convention, was amended to allow carbon dioxide to be stored in geological formations below the sea, a major step towards enabling the implementation of CCS. This means that a basis has been created in international environmental law to regulate CCS in sub-seabed geological formations for permanent isolation, as part of a suite of measures to tackle the challenge of climate change and ocean acidification.
- The Marine Bill White Paper, published in March 2007, sets out in more detail the progress made internationally and also some of the options we are considering for the regulation of sub-surface carbon dioxide storage in the marine environment.
- The UK CCS Regulatory Task Force has made good progress in preparing the regulatory environment for the whole CCS chain. We will be consulting on the conclusions of this work and on the options in the UK for regulation of the full chain of CCS technologies later this year.

5.4.26 In addition, in the light of the European Union's strategy to develop CCS by 2020, there has been much debate about the concept of "capture readiness" and the implications for Section 36 consent applications to build new and/or to retrofit existing fossil fuel power stations. The IEA, as part of the Gleneagles action plan, is investigating the concept of capture readiness for all fossil fuel power stations and its report is due to be published in May 2007.

5.4.27 We are considering whether we should require future fossil fuel power stations to be built "capture ready" and if so what the options would be for doing this. We will need to recognise that for some projects the scope for CCS (e.g. because of geographical location or other technical limitations) may be limited. We will launch a consultation later this year on the aspects of capture readiness which should be included in future applications for consent and how practically we might deal with this issue in the consenting process.

5.4.28 Progress is being made this year on regulatory frameworks in a number of international fora:

- The OSPAR convention is the current instrument guiding international co-operation on the protection of the marine environment of the North-East Atlantic. It is additional to the London Convention for this region. Technical guidelines are being developed, and a proposal has been made by Norway, the UK, France and the Netherlands for an amendment to the OSPAR Convention to allow storage of carbon dioxide in sub-seabed geological formations. This will be formally considered for adoption by OSPAR in June 2007.

- Following the recommendations of the EU Climate Change Programme's Working Group on CCS, the European Commission is reviewing the application and amendment of EU legislation for CCS, including the EU Waste and Water Directives. The outcomes are expected to be announced in proposals in autumn 2007.
- The Government is continuing to work with the Norwegian Government through the North Sea Basin Task Force to develop a common set of principles to regulate the transport and storage of carbon dioxide beneath the North Sea. The Task Force will submit a report to the UK and Norwegian energy ministers in 2007 which will lay the foundations for a regulatory framework to enable CCS to develop effectively, safely and in line with the Government's environmental principles.
- The Government has been pushing for recognition of CCS in the EU Emissions Trading Scheme, and in 2006 the EU Climate Change Programme's Working Group on CCS supported this view, and the Commission will address this in an EU proposal expected in autumn 2007. As an interim solution for Phase II (2008-12), the Commission has said that CCS projects can be "opted-in as a new activity" under Article 24 of the EU ETS Directive 2003/87/EC, and the Government is proactively pursuing this route with the Commission to ensure recognition in Phase II.
- The Government has been working through the EU to ensure that CCS is recognised in the Clean Development Mechanism, in particular to support its future deployment in China and India. Following a UN climate change meeting in Nairobi in November 2006, there is an agreed process to consider the issues towards a decision in 2008.

Cleaner coal and Carbon Capture and Storage for fossil fuels

Summary of measures

We are committed to enabling the development of low carbon fossil fuel fired power generation:

National actions

- **We committed in the Budget in 2007 to launch a competition to support the commercial-scale demonstration of CCS. When operational, this will make the UK a world leader in this globally important technology. Demonstration will enable the technology to be proven and will contribute to the roll out of CCS on a national and international basis.**
- **To support the potential deployment of CCS we will be launching a consultation on the options for the regulation of the full chain of CCS technologies later this year.**
- **We will be awarding contracts shortly to the successful prototype projects under the Carbon Abatement Technology (CAT) strategy to develop technologies for fossil fuel use that abate emissions.**
- **Later this year we will launch a consultation on the issue of capture readiness in future applications for consent under Section 36 of the Electricity Act.**



International actions

- We will publish our joint study with Norway on the infrastructure needed to transport and store carbon dioxide below the North Sea in July 2007.
- We will work with the European Commission and other Member States on an EU strategy to develop CCS for new fossil fuel power stations by 2020, if technically and economically feasible to do so.
- We will continue to promote the reform of international regulations affecting CCS.
- We are actively pursuing recognition of CCS in Phase II of the EU Emissions Trading Scheme and full inclusion within the scheme beyond 2012.
- Work on Phase I of the Near Zero Emissions Coal project in China is underway, as is dialogue with other countries on the demonstration/ deployment of CCS.

CCS demonstration in the UK could save 0.25 -1.0 Mt/yr of carbon by 2020 (depending on the size, technology and the number of demonstration power stations built).

Section 5.5 – Nuclear Power

Alongside this White Paper we are publishing a consultation document setting out the information and evidence that we have considered in reaching the preliminary view that it is in the public interest to give the private sector the option of investing in new nuclear power stations as part of our strategy to tackle the challenges of climate change and security of energy supply.

5.5.1 We recognise that this is a complex issue, in which there is significant public interest. This consultation will help us take a decision on the future of nuclear power in the UK, and whether it should be available as an option for companies investing in the UK energy market.

5.5.2 It is important that consideration of new nuclear power be seen in the context of our wider energy policy. For this reason the executive summary of the nuclear consultation is included below (with footnotes renumbered to ensure continuity in footnote numbering within the Energy White Paper). To view the full consultation document go to <http://www.dti.gov.uk/energy/whitepaper/consultations/nuclearpower2007>

Nuclear Consultation Document Executive Summary

Our energy challenge: climate change and energy security

1. Energy is an essential part of everyday life in the UK. We use it to heat and light our homes, to power our businesses and to transport people and goods. Without a clean, secure and sufficient supply of energy we would not be able to function as an economy or a modern society. In delivering this energy we face two major challenges: climate change and energy security.

2. Climate change represents a significant risk to global ecosystems, the world economy and human populations. The scientific evidence is compelling that human activities, and in particular emissions of greenhouse gases such as carbon dioxide, are changing the world's climate. In 2005, 40% of global carbon dioxide emissions were created by the generation of electricity¹⁷⁴.

3. Temperatures and sea levels are rising. There is no scientific consensus on just how long we have to avoid dangerous and irreversible climate change, but the overwhelming majority of experts believe that climate change is already underway, and without action now to dramatically reduce carbon dioxide emissions, we will have a hugely damaging effect on our country, planet and way of life.



4. The Stern Review of the economic impacts of climate change¹⁷⁵ highlighted the need for an urgent, coordinated international response. The analysis is stark. It suggests that working together to mitigate the problems of climate change now would cost about 1% of global GDP per annum by 2050 with a range of up to 4% to take account of a number of variables including the availability of technologies. But as a comparison, it could cost around 5% of global GDP per annum in the long term if we do nothing. This cost could rise, to as much as 20% of GDP, if we take into account a wider range of issues such as human health and the environment.

5. Historically, the UK has met most of its energy needs from domestic sources: coal, until the middle of the 20th century, and since the 1970s, oil and gas from the North Sea have driven our economy. Since the 1950s, nuclear power, fuelled by imported uranium, has generated a significant proportion of our electricity, reaching a peak of 30% of electricity output in the 1990s. Over the past decade nuclear power met about one-fifth of our electricity needs. If we had built fossil fuelled power stations rather than nuclear power stations, the UK's total carbon emissions from all sectors might have been 5% to 12% higher in 2004¹⁷⁶.

6. In the future, the UK will increasingly depend on imported oil and gas at a time of rising global demand and prices, and when energy supplies are becoming more politicised. At the same time, we know that over the next two decades or so almost one third of our coal and oil fired power stations are likely to close because of environmental legislation, and while nuclear operators may achieve life extensions at the existing UK plants, all but one of our nuclear power stations are due to have closed by 2023, based on their published lives. This will create new risks that need to be managed by our energy strategy.

7. Our aim should be to continue to raise living standards and the quality of life by growing our economy, while at the same time cutting waste and using every unit of energy as efficiently as possible. But based on existing strategies to reduce energy demand, the IEA predict global energy consumption is likely to grow by about 50% by 2030¹⁷⁷. Therefore we will also need to transform the way we produce the energy we need for light, heat and mobility.

Question 1

To what extent do you believe that tackling climate change and ensuring the security of energy supplies are critical challenges for the UK that require significant action in the near term and a sustained strategy between now and 2050?

¹⁷⁵ Sir Nicholas Stern, *The Stern Review: The Economics of Climate Change*, October 2006

¹⁷⁶ Sustainable Development Commission, *The Role of Nuclear Power in a Low Carbon Economy, Paper 2: Reducing CO₂ emissions – Nuclear and the Alternatives*, March 2006.

¹⁷⁷ International Energy Agency (IEA), *World Energy Outlook*, 2006.

Government's energy strategy

8. The strategy the Government has adopted for meeting the twin challenges of tackling climate change and ensuring energy security focuses on:

- saving energy;
- developing cleaner energy supplies; and
- securing reliable energy supplies at prices set in competitive markets.

Our strategy is set out in more detail in the Energy White Paper, published alongside this consultation¹⁷⁸.

9. Competitive energy markets, with independent regulation, are the most cost-effective and efficient way of generating, distributing and supplying energy. In those markets, investment decisions are best made by the private sector and independent regulation is essential to ensure that the markets function properly. However, energy markets on their own will not deliver our wider social and environmental objectives, particularly tackling climate change. That is why we have taken action, both at home and internationally to create a framework of incentives, rules and regulations that encourage energy saving and investment in low carbon technologies.

10. Capping and trading is a central tool for achieving carbon emission reductions. The EU's Emissions Trading Scheme (ETS) sets caps on emissions and puts a price on carbon emissions for the first time. This gives firms the incentive to make investments consistent with our carbon goals, whether by driving energy efficiency or investments in low-carbon energy. Electricity generating technologies such as renewables and nuclear power, benefit because they have low carbon emissions, giving them an advantage as an investment option compared with fossil fuel power stations.

11. At home, since 2002, we have required a growing percentage of electricity to be generated from renewable sources through the Renewables Obligation. The level of the Obligation is currently set to increase in annual steps from 6.7% in 2006/07 to 15.4% by 2015 and to remain at that level until 2027 when the mechanism is due to end. However, as announced in the Energy White Paper we will raise the levels of the Obligation up to 20% as necessary to keep ahead of actual levels of generation.

12. We therefore remain committed to the Renewables Obligation as a mechanism to ensure continuing investment in renewable electricity generation technologies. In the Energy White Paper we set out our proposals to strengthen and modify the Renewables Obligation. These proposals, to be implemented in 2009, will increase the level of renewables investment and deployment. It is very likely that following the European Council agreement on renewables we shall need to take further measures to increase the supply of renewable generation in the UK.

13. The proposals in the Energy White Paper, published with this consultation, along with the draft Climate Change Bill strengthen the policy framework on energy security and the reduction of carbon levels through carbon budgeting and



an effective carbon price. These will be constants in the face of future uncertainty and developments, such as the details of how the EU's renewables target will be implemented and its contribution to carbon reduction in the period to 2020.

EU Energy Policy

14. Since the Energy Review Report in 2006, the European Council agreed in March 2007 to a common strategy for energy security and tackling climate change. This includes further steps to complete the internal market in gas and electricity, and endorsement of the objective to save 20% of the EU's energy consumption in 2020 compared with current projections. The agreement commits the EU to a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action. The agreement assigns the EU emissions trading scheme the central role in the EU's long-term strategy for reducing greenhouse gas emissions.

15. The European Council agreement also recognises the potential importance of carbon capture and storage and sets a target for the share of energy from renewables of 20% by 2020. The target covers the energy we use in heat and transport as well as electricity. The Council also agreed a 10% binding minimum target, to be achieved by all Member States, for the share of biofuels in EU petrol and diesel consumption; this is subject to conditions, including that the production of biofuels is sustainable.

16. The 20% renewables target is an ambitious goal representing a large increase in Member States' renewables capacity. Latest data show that the current share of renewables in the UK's total energy mix is around 2% and for the EU as a whole around 6%¹⁷⁹. Projections indicate that, on the basis of existing policies in the UK and the EU, by 2020, renewables would contribute around 5% of the UK's consumption and are unlikely to exceed 10% of the EU's¹⁸⁰.

17. The European Commission has been asked to bring forward detailed proposals – including for each Member State's contribution to the EU targets on greenhouse gases and renewables – by the end of this year. In developing the proposals, the Commission will need to take account of individual national circumstances and discuss and agree their proposals with Member States and the European Parliament during 2008/09. In developing proposals for the renewables target, the Commission will need, as agreed by the European Council, to give due regard to a fair and adequate allocation, taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix.

¹⁷⁹ The UK figure is from the Digest of the United Kingdom Energy Statistics (DUKES), 2006.

The European figures come from Eurostat.

http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL

¹⁸⁰ The UK figure is based on DTI projections – for more detail see *UK Energy and CO₂ Emissions*

Projections, May 2007 <http://www.dti.gov.uk/energy/whitepaper>. The European figures come from the EU Commission Renewable Energy Road Map. *Renewable energies in the 21st century: building a more sustainable future* COM(2006)848 final.

18. All this means there is some uncertainty as to the size and nature of the UK's contribution to the EU greenhouse gas and renewables targets. To inform our discussions and negotiations, we will need to analyse the full implications of the proposed UK contributions including: technical feasibility, cost effectiveness, our existing and potential capacity for deployment of low carbon technologies including renewables, our overall energy mix and the wider implications for energy policy including energy security and reliability.

19. We are already in discussion with European counterparts on these issues. In parallel we are conducting detailed analysis to explore how the EU Spring Council agreement can be implemented in the most effective way. We shall be engaging actively with interested parties, including energy producers and users, in taking this work forward.

20. After a decision has been reached on each Member State's contribution to the EU agreement, it is very likely that the UK will need to take further measures, beyond those set out in the Energy White Paper published alongside this consultation, to make our contribution to meeting these targets, and in particular to increase the share of renewable electricity, heat and transport, in our mix by 2020.

Why we need to consider the future role of nuclear power now

21. Nuclear power has been part of the UK's energy mix for the past five decades. Currently it provides about 18% of the electricity we use in our homes and workplaces. In the UK, about one third of our emissions of carbon dioxide come from electricity generation¹⁸¹. The vast majority of those emissions come from coal and gas power plants.

22. Energy companies will need to invest in around 30-35GW of new electricity generating capacity – as coal and nuclear plants retire – over the next two decades, with around two-thirds needed by 2020. This is equivalent to about one-third of our existing capacity.

23. The UK needs a clear and stable regulatory framework to reduce uncertainty for business to help ensure sufficient and timely investment in technologies that contribute to our energy goals.

24. Of the capacity that is likely to close over the two decades, two thirds is from carbon intensive fossil fuel generation and about 10GW is nuclear and therefore low carbon. So companies' decisions on the type of power stations they invest in to replace this capacity will have significant implications for the level of carbon emissions. As an illustration, if our existing nuclear power stations were all replaced with fossil fuel fired power stations, our emissions would be between eight and sixteen MtC (million tonnes of carbon) a year higher as a result (depending on the mix of gas and coal-fired power stations). This would be equivalent to about 30-60% of the total carbon savings we project to achieve under our central scenario from all the measures we are bringing forward in the Energy White Paper¹⁸². Our gas demand would also

181 Updated Emissions Projections, July 2006, DTI, <http://www.dti.gov.uk/files/file31861.pdf>

182 DTI: *Energy White Paper, Meeting the Energy Challenge*, <http://www.dti.gov.uk/energy/whitepaper>



be higher, at a time when we are becoming more dependent on imported sources of fossil fuels.

25. New nuclear power stations have long lead times. This time is necessary to secure the relevant regulatory and development consents which must be obtained before construction can begin, and there is also a long construction period compared to other generating technologies¹⁸³. New nuclear power stations are therefore unlikely to make a significant contribution to the need for new capacity before 2020.

26. Even with our expectations that the share of renewables will grow, it is likely that fossil fuel generation will meet some of this need. However, beyond that date there are still significant amounts of new capacity needed; for example, in 2023 one third or 3GW of our nuclear capacity will still be operational, based on published lifetimes. Given the likely increase in fossil fuel generation before this date, it is important that much of this capacity is replaced with low carbon technologies. New nuclear power stations could make an important contribution, as outlined in this consultation document, to meeting our needs for low carbon electricity generation and energy security in this period and beyond to 2050. Because of the lead-times, without clarity now we will foreclose the opportunity for nuclear power.

27. The existing approach on new nuclear build was set out in 2003¹⁸⁴:

"Nuclear power is currently an important source of carbon-free electricity. However, its current economics make it an unattractive option for new, carbon-free generating capacity and there are also important issues of nuclear waste to be resolved. These issues include our legacy waste and continued waste arising from other sources. This white paper does not contain specific proposals for building new nuclear power stations. However, we do not rule out the possibility that at some point in the future new nuclear build might be necessary if we are to meet our carbon targets. Before any decision to proceed with the building of new nuclear power stations, there will need to be the fullest public consultation and the publication of a further white paper setting out our proposals."

28. Since 2003 there have been a number of developments, which have led the Government to consider afresh the potential contribution of new nuclear power stations. Firstly, there has been significant progress in tackling the legacy waste issue:

- we have technical solutions for waste disposal that scientific consensus and experience from abroad suggest could accommodate all types of wastes from existing and new nuclear power stations;
- there is now an implementing body (the Nuclear Decommissioning Authority), with expertise in this area, and Government is reconstituting the Committee on Radioactive Waste Management (CoRWM) in order to provide continued independent scrutiny and advice; and
- a framework for implementing long-term waste disposal in a geological repository will be consulted on in the coming months.

¹⁸³ Our conservative assumption is that for the first new nuclear plant the pre-construction period would last around 8 years (to secure the necessary consents) and the construction period would last around 5 years. For subsequent plants this is assumed to be 5 and 5 years; respectively.

¹⁸⁴ HMG Cm 5761: *Energy White Paper, Our Energy Future – creating a low carbon economy*, 2003.

29. The Government has also made progress in considering the issue of waste management in relation to potential new nuclear power stations:

- this consultation provides the opportunity to discuss the ethical, intergenerational and public acceptability issues associated with a decision to allow the private sector to invest in new nuclear power stations and generate new nuclear waste;
- the Government is developing specific proposals to protect the taxpayer. Under these proposals, private sector developers would meet the full decommissioning costs and full share of waste management costs. The proposals would be implemented in the event that we conclude that energy companies should be allowed to invest in new nuclear power stations. They would need to be in place before proposals for new power stations could go ahead.

30. Secondly, the high-level economic analysis of nuclear power, prepared for the Energy Review, concluded that under likely scenarios for gas and carbon prices and taking prudent estimates of nuclear costs, nuclear power would offer general economic benefit to the UK in terms of reduced carbon emissions and security of supply benefits¹⁸⁵. Therefore, the Government believes that it has a potential contribution to make, alongside other low-carbon generating technologies.

31. Thirdly, some energy companies have expressed a strong interest in investing in new nuclear power stations. They assess that new nuclear power stations could be an economically attractive low-carbon investment, which could help diversify their generation portfolios. Their renewed interest reflects assessments that with carbon being priced to reflect its impacts and gas prices likely to be higher than previously expected, the economics of new nuclear power stations are becoming more favourable.

32. Nuclear power stations have long lead times. If they are to be an option to replace the capacity closing over the next two decades, and in particular after 2020, a decision on whether allowing energy companies the option of investing in new nuclear power stations would be in the public interest, needs to be taken now. Energy companies would need to begin their initial preparations in the near future in order to have a reasonable prospect of building new generation in this period. Not taking the public interest decision now would foreclose the option of new nuclear being one of our options for tackling climate change and achieving energy security.

Our preliminary view on nuclear power

33. We face a great deal of uncertainty about our energy supplies over the next couple of decades. Most obviously the pace of climate change and geopolitical developments. But there are also uncertainties relating to future fossil fuel and carbon prices; the speed at which we can achieve greater energy efficiency and therefore likely levels of energy demand here and globally; the speed, direction and future economics of development in the renewable sector; and the technical feasibility and costs associated with applying carbon capture and storage technologies to electricity generation on a commercial scale.



34. Faced with these uncertainties the Government believes we need diversity and flexibility in the energy mix and a policy framework that opens up the full range of low carbon options. As well as renewables, those options should include the use of gas and coal with carbon capture and storage along with nuclear power. We agree with the recently published fourth report of the Intergovernmental Panel on Climate Change (IPCC) that nuclear power could have a role to play alongside other low carbon energy sources in reducing carbon emissions¹⁸⁶.

35. Tackling climate change and ensuring energy security will require action on many fronts: both supply and demand, engaging individuals and business. Unnecessarily ruling out any of the options available is likely to increase the risks of not achieving these objectives. Our preliminary view is that preventing energy companies from investing in new nuclear power stations would increase the risk of not achieving our long-term climate change and energy security goals, or achieving them at higher cost.

36. Apart from large-scale hydro – the opportunities for which have been largely exhausted in the UK – nuclear power is the only low-carbon form of baseload generation, which is proven on a commercial scale. Without nuclear power as an option, the alternative would be for energy companies to invest in significant fossil fuel capacity, whether of the conventional kind or fitted with carbon capture and storage technology, and to build renewable capacity over and above our existing targets, particularly as we will need to replace existing nuclear stations as they retire.

37. Nuclear power also has disadvantages, including producing radioactive waste that needs long-term management and presenting health and safety risks. The Government believes that they can be managed and mitigated so that they do not in themselves provide a reason for not allowing energy companies the option of investing in new nuclear power stations.

38. The Government is committed to the fullest public consultation on its proposals before a decision is taken on whether it would be in the public interest for energy companies to have the option of investing in new nuclear power stations. Such a decision would mean nuclear power stations could be developed alongside renewables and other low-carbon technologies, as part of the electricity sector's contribution to tackling the challenges of climate change and energy security.

39. This is an important decision that will have implications for society for decades to come, and on which some people will have strong views. Therefore we are keen to gather responses from a range of perspectives to allow us to assess the factors before reaching a firm conclusion. This consultation takes account of the ruling of the High Court in February and the Government's commitment in 2003¹⁸⁷ to the fullest public consultation and the publication of a further White Paper setting out confirmed proposals for new nuclear power stations.

¹⁸⁶ Intergovernmental Panel on Climate Change (IPCC) Working Group III Report, *Mitigation of Climate Change, Summary for policy makers*, May 2007, <http://www.ipcc.ch/SPM040507.pdf>

¹⁸⁷ Energy White Paper *Our Energy Future – creating a low carbon economy*, HMG Cm 5761, 2003.

40. This consultation will help the Government to take a decision on the future of nuclear power in the UK, and whether it should be an option for companies investing in the UK's energy market. In reaching our preliminary view, we have considered a number of issues relating to nuclear power.

In this consultation document we set out the information and evidence that Government has considered in reaching its preliminary view:

- nuclear power and carbon emissions (chapter two);
- security of supply impacts of nuclear power (chapter three);
- economics of nuclear power (chapter four);
- the value of having low carbon electricity generation options: nuclear power and the alternatives (chapter five);
- safety and security of nuclear power (chapter six);
- transport of nuclear materials (chapter seven);
- waste and decommissioning (chapter eight);
- nuclear power and the environment (chapter nine);
- the supply of nuclear fuel (chapter ten);
- supply chain and skills implications (chapter eleven); and
- reprocessing of spent fuel (chapter twelve).

41. The information and evidence, and the Government's preliminary conclusions, in each of these chapters is summarised below. There are questions at the end of each section; respondents are invited to answer these questions based on the information in this summary and the full material in the document as necessary.

Nuclear power and carbon emissions

42. Nuclear power, unlike fossil fuelled power generation is carbon-free at the point of generation and is low carbon overall. Some carbon dioxide emissions arise at other points in the lifecycle, for example during the mining of uranium, fuel preparation, and construction and decommissioning of the power station, but this is true to some extent for all electricity generating technologies and different technologies produce different quantities of emissions.

43. To provide an accurate picture of the potential contribution that nuclear power stations could make to tackling climate change, a full-lifecycle analysis must be made. In other words, the emissions from every phase must be measured. There are a number of assumptions that need to be made in undertaking such an analysis. For example, the type of electricity used for the preparation of nuclear fuel: if it were from coal-fired power stations, emissions would be significantly higher than if nuclear or renewable sources were used in the fuel preparation process. As a result of these variables, there is a fairly wide range of estimates in the studies that have looked at lifecycle carbon dioxide emissions from nuclear power.

44. Research by the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-Operation and Development (OECD), and the International Atomic Energy Authority (IAEA)¹⁸⁸ found that nuclear power emits low amounts of carbon dioxide across the whole lifecycle, between 7g/kWh and 22g/kWh. This is similar to the carbon dioxide emissions from wind power and much less than fossil

¹⁸⁸ Sustainable Development Commission, *The Role of Nuclear Power in a Low Carbon Economy*, Paper 2: Reducing CO₂ Emissions – Nuclear and the Alternatives, March 2006.

¹⁸⁹ Sustainable Development Commission, *The Role of Nuclear Power in a Low Carbon Economy*, Paper 2: Reducing CO₂ Emissions – Nuclear and the Alternatives, March 2006.



fuelled plant¹⁸⁹. Emissions from gas and coal-fired power stations are estimated to be over 380g/kWh and 830g/kWh, respectively¹⁹⁰.

45. The Government believes that, based on the significant evidence available, the lifecycle carbon emissions from nuclear power stations are about the same as wind generated electricity with significantly lower carbon emissions than fossil fuel fired generation. As an illustration, if our existing nuclear power stations were all replaced with fossil fuel fired power stations, our emissions would be between 8 and 16MtC (million tonnes of carbon) a year higher as a result (depending on the mix of gas and coal-fired power stations). This would be equivalent to about 30-60% of the total carbon savings we project to achieve under our central scenario from all the measures we are bringing forward in the Energy White Paper. Therefore, the Government believes that new nuclear power stations could make a significant contribution to tackling climate change. We recognise that nuclear power alone cannot tackle climate change, but these figures show that it could make an important contribution as part of a balanced energy policy.

Question 2

Do you agree or disagree with the Government's views on carbon emissions from new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Security of supply benefits of nuclear power

46. The Government is committed to ensuring sufficient, reliable, diverse supplies of energy at affordable prices for electricity, heating and transport. Where supplies of energy are limited or insecure, the result is likely to be unexpectedly high or volatile energy prices. The UK faces two main security of supply challenges:

- our increasing reliance on imports of oil and gas in a world where energy demand is rising and in some cases energy is becoming more politicised; and
- our requirement for substantial, and timely, private sector investment over the next two decades in: new gas import infrastructure and storage; electricity generation to meet rising demand and replace retiring stations; and the replacement of ageing transmission and distribution networks.

47. Having a diverse supply of energy is an important factor in security of supply. This can mean both diversity in the type of fuel used, and also diversity in the geographic distribution of fuel sources. Avoiding over-dependence on single sources lessens the impact of "technology failure" or supply chain interruptions.

190 OECD Nuclear Energy Agency

48. To this extent, nuclear power, by generating about 18% of our electricity, already makes an important contribution to the security of our energy supplies, adding diversity to the energy mix and avoiding an over-dependence on imported fossil fuels, particularly gas. However, by 2024, all but one of our nuclear power stations will have closed, based on current published accounting lifetimes.

49. There are also particular characteristics of nuclear power stations that contribute to the security of our energy supplies. Nuclear generation extends the geographic spread of our energy imports, because uranium reserves are located in areas like Australia and Canada, which are different locations to where the global fossil fuel reserves are found¹⁹¹. Its cost profile, with high capital but low fuel and operating costs, means that the generation costs are relatively immune to fluctuations in fuel prices. This is in contrast to fossil fuel generation, and having nuclear power as part of the mix adds an element of stability to wholesale energy prices in the UK. Nuclear power is most economic when run continually, so it is well placed to meet the need for baseload capacity in the UK. Nuclear power would complement the expansion in more intermittent renewable generation such as wind power.

50. The Government believes that the best way to achieve secure energy supplies is by encouraging a diversified mix of generating technologies, and that energy companies should have the widest choice of technologies in which to invest. We know that our nuclear power stations are coming to the end of their lives; not allowing energy companies to invest in new nuclear power stations would increase our dependence on fewer technologies and expose the UK to risks to the security of our energy supplies.

51. The Government believes that allowing energy companies the option of investing in nuclear power stations would make a contribution to maintaining a diverse generating mix, with the flexibility to respond to future developments that we cannot yet envisage. Allowing energy companies the option of investing would therefore make an important contribution to the security of our energy supplies.

Question 3

Do you agree or disagree with the Government's views on the security of supply impact of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?



Economics of nuclear power

52. It would be for private sector energy companies to propose and fund the construction and operation of any new nuclear power stations, including meeting the full costs of decommissioning and full share of waste management costs. As with the existing nuclear power stations, there is a potential government liability in accordance with international Conventions to cover third party damages in the unlikely event of a major accident. If, within this framework, private sector energy companies concluded that nuclear power stations were not economic, or the financial risks were too great, then they would not build them.

53. Whether nuclear power stations are economically attractive will depend on, amongst other things, the contracts into which developers enter for the electricity they generate, and their financing costs. The proposed Government facilitative action (see chapter thirteen) would be important in reducing uncertainty during the preconstruction period. Uncertainty in the regulatory framework can increase costs for investors, especially financing costs.

54. The Government has updated the indicative cost-benefit analysis of new nuclear power stations that was prepared for the Energy Review Report last year. Our analysis uses a range of prices for carbon and gas, and a range to reflect uncertainties in the costs of nuclear generation, in particular waste and decommissioning costs. Our range of cost estimates also reflects different views on the future commitment to pricing carbon and the extent to which gas prices will remain linked to oil prices, which is currently an important factor in gas prices. The conclusions are consistent with and backed up by those used in the 2006 IEA World Energy Outlook report¹⁹².

55. Based on this conservative analysis of the economics of nuclear power, the Government believes that nuclear power stations would yield economic benefits to the UK in terms of reduced carbon emissions and security of supply benefits under likely scenarios for gas and carbon prices. As an illustration, under central gas and nuclear cases, and with a future carbon price of €36/tCO₂, the net present value over 40 years of adding 10GW of nuclear capacity would be of the order of £15 billion.

Question 4

Do you agree or disagree with the Government's views on the economics of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

¹⁹² International Energy Agency, *World Energy Outlook 2006*.

The value of having low carbon electricity generation: nuclear power and the alternatives

56. There are many uncertainties in the energy market, both internationally and at home. For example, it is difficult to predict fossil fuel, raw materials and carbon prices long into the future, we do not know with certainty which and at what speed new renewable technologies, such as marine generation might develop, and it is not guaranteed that it will be technically feasible or economic to apply carbon capture and storage technology safely to electricity generation on a commercial scale.

57. Moreover, there are even greater uncertainties about the future of the electricity market. Some technological developments could result in a significant increase in the demand for electricity in the future. For example, if hydrogen and electric technologies develop in the transport sector, then it could have a significant impact on electricity demand¹⁹³. Faster than expected economic growth could also create increased demand for electricity, as could the need to rely more on electricity for the provision of heat, as fossil fuel reserves continue to decline. The possibility of electricity storage technologies developing on an economic scale is another uncertainty that could affect demand.

58. There is also uncertainty in the science of climate change and the potential constraints that this could put on our energy strategy. Our goal to reduce carbon emissions by at least 60% of 1990 levels by 2050 was in line with the then recommendations of the Royal Commission on Environmental Pollution¹⁹⁴. The draft Climate Change Bill has provisions to amend our targets for reductions in carbon emissions in the light of significant developments in climate science or in international law or policy. A larger reduction in carbon emissions would increase the need for low carbon energy sources.

59. Given these risks and uncertainties about the way the world and energy markets may develop, it is very difficult to predict which composition of the fuel mix or share of each technology in the mix is most appropriate to minimise the risks and costs associated with achieving our energy goals. For this reason, we believe companies are better placed to weigh up this complex range of interrelated factors affecting the profitability of investing in electricity generation (including how these factors might evolve over time). Providing firms with a portfolio of options offers a hedge against risks like technology failure or over-dependence on a limited range of fuel supplies.

60. It is possible, using economic modelling, to estimate the impact in the medium and long-term of excluding the option for private sector investment in new nuclear power stations on our ability to meet our energy policy goals to tackle climate change and ensure energy security. In this consultation document and as part of our work for the Energy White Paper, we have used two different models to examine possible scenarios with and without the option of nuclear power.

¹⁹³ For instance, a successful transition to electric and hydrogen vehicles could see UK electricity demand rise by 16 to 34% on 2005 levels. E4tech. A review of the UK Innovation System of low carbon Road transport, <http://www.dft.gov.uk/pgr/scienceresearch/technology>

¹⁹⁴ The Royal Commission for Environmental Pollution, 22nd Report *Energy – The Changing Climate* <http://www.rcep.org.uk/newenergy.htm>



61. To examine how investment in new electricity generation capacity might evolve in the period to 2030, we have used a dynamic model to simulate investment decisions¹⁹⁵. According to our analysis, in the period up to 2020, excluding nuclear power has relatively little impact on our energy security and climate change goals. This is because the long lead times for new nuclear power stations mean that even if we decide that it is in the public interest to allow private sector companies the option to invest in new nuclear power, significant new capacity is not likely to be operational before 2020.

62. According to our economic modelling, in the period from 2020-2030, not allowing investment in new nuclear power stations would increase the risk to the security of our energy supplies because between 2-4GW less new generation capacity is built. The modelling also suggests there would be a less diverse generation mix as investors have fewer available options. This implies there would be less spare generation capacity to cope with unexpected variations in demand or problems with electricity supply. Given the carbon price assumptions in the modelling, nuclear power becomes the cheapest generation technology by around 2023. Consequently, the modelling shows that expectations of electricity prices do not rise sufficiently to stimulate new investment in other more expensive technologies until much later in the 2020s.

63. This projected lower level of investment would put pressure on wholesale electricity prices, because there would be less capacity than otherwise to meet increases in demand during peak periods. In the period between 2020-2030, the modelling suggests that wholesale prices would be around 4% higher, on average, than if nuclear was included as an option. At the same time, our carbon emissions in the period between 2020-2030 could be around 4MtC higher, on average, than if nuclear was included as an option. As indication of the significance of this figure, 4MtC would be equivalent to around 16% of the annual carbon savings projected in 2020 to be achieved under the central scenario from all the measures in the Energy White Paper "Meeting the Energy Challenge".

64. It is extremely difficult to predict how the energy system will develop in the very long-term (the next 40-50 years). It is therefore much harder to predict what investments in new electricity capacity firms will choose to make over this period. Indeed, even if the option of investing in nuclear were available, companies may still decide to invest in other technologies if they considered them to be more attractive investment options. Their investment decisions are affected by their view of future electricity demand, the underlying costs of new investments, their expectations of future electricity, fuel and carbon prices, expected closures of existing power stations and the construction lead times for new power stations.

¹⁹⁵ Redpoint Energy, *Dynamics of GB Electricity Generation Investment: Prices, Security of Supply, CO₂ Emissions and Policy Options*, 2007.

65. However, for the period to 2050, we have used a model of the entire UK energy system (UK MARKAL-Macro model) to explore the changes to the amount and use of energy required if we are to deliver our goal of reducing carbon emissions by 60% by 2050 at least cost¹⁹⁶. In all the scenarios we examined where nuclear is available as an option, our modelling shows new nuclear power playing a role in meeting our 2050 goals, even where the cost of alternative technologies falls significantly.

66. Where nuclear is excluded as an investment option, the modelling shows that to meet the 60% goal, more investment is needed in alternatives such as wind, and coal with carbon capture and storage. For example, wind would have to grow from the current level of around 1-2% today to 30% of the generation mix in 2050 in such a scenario. In addition, further carbon emissions savings in other sectors such as transport would be required. We would need to see profound behavioural changes in the way we use energy. For instance, demand for electricity would have to decline by 6% compared to today's levels even though over the same period the economy is projected to grow to three times its current size.

67. Our modelling indicates that excluding nuclear is a more expensive route to achieving our carbon goal even though in our modelling, the costs of alternative technologies are assumed to fall over time as they mature. It also assumes that we are able successfully to deploy CCS safely and cost-effectively on a large scale even though currently, the technology has not yet been proven at a commercial scale. The modelling also does not capture a number of risks implicit in our assumptions. For example, technology costs may not fall as much or as quickly as assumed.

68. The Government believes that given the wide range of uncertainties it is difficult to predict with certainty the future need for and use of energy and electricity.

69. We have modelled a number of different future scenarios as part of the analysis to support the Energy White Paper. The modelling indicates that it might be possible under certain assumptions, to reduce the UK's carbon emissions by 60% by 2050 without new nuclear power stations. However, if we were to plan on this basis, we would be in danger of not meeting our policy goals:

- **Security of supply: we would be reliant on a more limited number of technologies to achieve our goals, some of which (e.g. carbon capture and storage) are yet to be proven on a commercial scale with power generation. This would expose the UK to greater security of supply risks, because our electricity supplies would probably be less diverse as a result of excluding nuclear; and**
- **reducing carbon emissions: by removing one of the currently more cost-effective low carbon options, we would increase the risk of failing to meet our long term carbon reduction goal.**

196 DTI, *The UK MARKAL model in the 2007 Energy White Paper*, <http://www.dti.gov.uk/energy/whitepaper>
Strachan N., R. Kannan and S. Pye (2007), *Final Report on DTI-DEFRA Scenarios and Sensitivities using the UK MARKAL and MARKAL-Macro Energy System Models*, <http://www.ukerc.ac.uk/content/view/142/112>



70. By excluding nuclear as an option, our modelling also indicates that meeting our carbon emissions reduction goal would be more expensive.

71. Therefore, the Government believes that giving energy companies the option of investing in new nuclear power stations lowers the costs and risks associated with achieving our energy goals to tackle climate change and ensure energy security.

Question 5

Do you agree or disagree with the Government's views on the value of having nuclear power as an option? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Safety and security of nuclear power

72. Nuclear power stations pose safety, security, health and non-proliferation risks that need to be managed. Accordingly, there is a regulatory regime in the UK that caters for existing facilities and would protect against the risks arising from any new nuclear power stations. This regime is subject to international scrutiny. A recent review by the International Atomic Energy Agency (IAEA) concluded that the UK's regulatory regime was well advanced, flexible and transparent, and the inspectors were highly trained, well-experienced experts¹⁹⁷.

73. Before any nuclear power station can be constructed, permission is required from the Nuclear Installations Inspectorate (NII), a division of the Health and Safety Executive. The NII publish a number of Safety Assessment Principles that set out guidance on what it looks for when considering the safety of a nuclear power station.

74. The UK has not had an incident at a civil nuclear power station where there has been an offsite release of radioactive material¹⁹⁸. Analysis by the European Commission on the potential for nuclear events suggests that in the UK the probability of a major accident – the meltdown of the reactor's core along with failure of the containment structure – is one in 2.4 billion per reactor year¹⁹⁹. By comparison, it is thought that the risks of a meteorite over a kilometre hitting the earth, which could have significant global environmental impacts, could be one in 0.5 million per year²⁰⁰.

75. However, a major nuclear accident, although having an extremely low likelihood of occurring, would have potentially severe and wide-ranging consequences, so we have to consider very carefully whether it is reasonable to run such a risk.

76. The health risk of exposure to radiation from nuclear power stations is very small, and there are statutory radiation dose limits in place, both for workers in the nuclear industry and the general public²⁰¹. The average dose to a member of the public as a result of discharges from the nuclear power industry is 0.015% of the annual dose from all sources²⁰². The independent

¹⁹⁷ HSE report – *The health and safety risks and regulatory strategy related to energy developments. An expert report contributing to the Government's Energy Review 2006*.

¹⁹⁸ Sustainable Development Commission, *Paper 6: Safety and Security*, March 2006.

¹⁹⁹ European Commission, *Externalities of Energy (ExternE), Methodology 2005 Update*.

²⁰⁰ NASA Asteroid and Comet Impact Hazards, http://128.102.32.13/impact/intro_faq.cfm

²⁰¹ Ionising Radiation Regulations 1999.

²⁰² Radiation Doses – Maps and Magnitudes Second Edition, National Radiological Protection Board, now part of Health Protection Agency.

Committee on Medical Aspects of Radiation in the Environment (COMARE) has not identified any evidence of increased incidents of childhood cancer in areas surrounding nuclear power stations²⁰³.

77. Although nuclear power stations pose some unavoidable terrorism risks, the Office for Civil Nuclear Security (OCNS), the security regulator, is satisfied that the existing security regime is robust and effective and that allowing new nuclear power stations to be built would be unlikely to materially increase the risks to the UK, because any proposals for new nuclear power stations would be only be permitted to proceed if they met the stringent regulatory requirements in full, based on the most up to date threat assessments.

78. The UK Safeguard Office, who oversee non-proliferation risks, believe that the risk of diversion of nuclear materials from the building and operation of modern nuclear power stations in the UK is very small, because of the regulatory and market framework and the nature of the designs of nuclear power stations that might be put forward.

79. Based on the advice of the independent nuclear regulators, and the advances in the designs of nuclear power stations that might be proposed by energy companies, the Government believes that the safety, security, health and non-proliferation risks of new nuclear power stations are very small and that there is an effective regulatory framework in place that ensures that these risks are minimised and sensibly managed by industry. Therefore, the Government believes that they do not provide a reason to prevent energy companies from investing in new nuclear power stations.

Question 6

Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Transport of nuclear materials

80. Generating electricity from nuclear power stations requires the transport of nuclear materials, such as uranium for fuel fabrication and spent fuel. There is a wide range of radioactive material that needs to be transported for the nuclear power industry; however, it is only certain materials such as spent fuel where radioactivity levels, and therefore associated risks, are high. The relative risks associated with the transport of the material are reflected in the regulatory protections. For example, the regulatory requirements for flasks used to transport spent fuel, the most radioactive nuclear material that is transported, are the most stringent. By contrast, raw and enriched uranium, and even freshly prepared fuel are not very radioactive.

²⁰³ *The incidence of childhood cancer around nuclear installations in Great Britain, COMARE 11th Report, July 2006.*



81. Transport of nuclear fuel by rail, road and sea has been carried out for the past 40 years by several countries that use nuclear power. In this time, in the European Union, there have been no accidents involving the transport of nuclear materials that have caused death or serious injury to persons or significant harm to the environment from a radiological cause²⁰⁴.

82. Workers in the transport industry receive an average annual dose of radiation of less than 0.7 millisieverts (mSv) from the transport of radioactive material. This is much less than the limit for radiation workers of 20 mSv per year, and is even below the dose limit of 1mSv for the general public from activities covered under the Ionising Radiations Regulations 1999. Conservative estimates of the dose to the general public from the transport of radioactive materials are a hundredth this level, no more than 0.006 mSv per year²⁰⁵, compared to an average annual dose from natural background radiation of 2.6mSv²⁰⁶. According to the Health Protection Agency, these doses are extremely low²⁰⁷.

83. All such transport is subject to regulatory requirements aimed at ensuring that these movements are carried out in a safe and secure fashion. This is embedded in IAEA regulations and implemented in the UK by the Department for Transport (Dangerous Goods Division). The European Parliament concluded in 2001, in its resolution on Transport of Radioactive Material, that the risks associated with the transport of radioactive material are low²⁰⁸.

84. Based on the assumption that spent fuel would not be reprocessed (see chapter twelve) and that developers would be expected to provide appropriate storage arrangements capable of being maintained safely until the spent fuel is ultimately removed for disposal (chapter eight), allowing private sector energy companies to invest in new nuclear power stations would not create the need to transport spent fuel to a reprocessing facility and then subsequently to a repository. Instead, spent fuel would be held in interim storage, during which time, the initial radioactivity would decline as the more active isotopes decay, and only a single movement, of somewhat less radioactive waste, could be made to the repository.

85. Given the safety record for the transport of nuclear materials, the assumption that spent fuel will not be reprocessed and the strict safety and security regulatory framework in place, the Government believes that the risks of transporting nuclear materials are very small and that there is an effective regulatory framework in place that ensures that these risks are minimised and sensibly managed by industry. Therefore, the Government believes that they do not provide a reason to not allow energy companies to invest in new nuclear power stations.

204 Health Protection Agency, *Survey into the Radiological Impact of the Normal Transport of Radioactive Material in the UK by Road and Rail*, http://www.hpa.org.uk/radiation/publications/w_series_reports/2005/nrpb_w66.pdf.

205 Health Protection Agency, *Survey into the Radiological Impact of the Normal Transport of Radioactive Material in the UK by Road and Rail*, http://www.hpa.org.uk/radiation/publications/w_series_reports/2005/nrpb_w66.pdf.

206 Sustainable Development Commission, *Paper 6: Safety and Security*.

207 Health Protection Agency, *Survey into the Radiological Impact of the Normal Transport of Radioactive Material in the UK by Road and Rail*, http://www.hpa.org.uk/radiation/publications/w_series_reports/2005/nrpb_w66.pdf.

208 Official Journal of the European Community, *Safe transport of radioactive material*, A5-0040/2001, 2001

Question 7

Do you agree or disagree with the Government's views on the transport of nuclear materials? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Waste and decommissioning

86. Nuclear power stations generate long-lived radioactive waste that needs to be handled and stored carefully and ultimately disposed of in an appropriate long-term management facility. The UK has a significant legacy of nuclear waste. Although the majority of this waste is of a low level of radioactivity, there are also higher level wastes and spent fuel from nuclear power stations that need to be managed.

87. In 2007, the Government updated its policy on low level waste management and gave responsibility to the Nuclear Decommissioning Authority (NDA) for developing and maintaining a national strategy for the handling of low level nuclear waste. This will include identifying additional disposal capacity because the UK's existing facility will not provide enough capacity for the expected waste from the decommissioning of the existing UK nuclear power stations.

88. In 2001, Government launched the Managing Radioactive Waste Safely programme to consider the issues of managing and disposing of the UK's higher level radioactive waste. As part of this programme, in October 2006, the Government's response to the independent Committee on Radioactive Waste Management's (CoRWM) recommendations acknowledged that geological disposal coupled with safe and secure interim storage is the best nuclear waste management approach currently available for existing waste.

89. The Government will shortly publish a consultation on the implementation process for developing a long-term waste management solution. The responsibility for planning and implementing geological disposal has been given to the Nuclear Decommissioning Authority.

90. The CoRWM terms of reference focussed principally on legacy waste and the focus of CoRWM's public and stakeholder engagement was always on the existing and committed wastes and materials as there were no new build proposals for them to consider in detail. However, as part of their report on the inventory of waste that needed to be managed, the Committee made reference to the potential implications of a new build scenario. CoRWM set down that its: *"recommendations are directed to existing and committed waste arisings"*²⁰⁹. CoRWM stated that they had: *"no position on the desirability or otherwise of nuclear new build"*²¹⁰ and CoRWM believed that *"its recommendations should not be seen as either a red or green light for nuclear new build"*²¹¹.

91. CoRWM stated that: *"solutions for existing and unavoidable future wastes would also be robust in the light of all reasonably foreseeable developments in nuclear energy and waste management practices"*²¹², although they felt that

209 CoRWM's *Managing our Radioactive Waste Safely* (CoRWM Document 700), CoRWM's Recommendations to Government, July 2006. <http://www.corwm.org.uk/content-1092>

210 CoRWM statement on Nuclear New Build 16 December 2005.

211 CoRWM's *Managing our Radioactive Waste Safely* (CoRWM Document 700), CoRWM's Recommendations to Government, July 2006. <http://www.corwm.org.uk/content-1092>

212 CoRWM statement on Nuclear New Build 16 December 2005.



“significant practical issues would arise, including the size, number and location of waste management facilities”²¹³. CoRWM also commented that “the prospect of a new nuclear programme might undermine support for CoRWM from some stakeholders and citizens and make it more difficult to achieve public confidence”²¹⁴. CoRWM considered that “should a new build programme be introduced... it would require a quite separate process to test and validate proposals for the management of wastes arising”²¹⁵.

92. We agree with CoRWM that the creation of new waste involves ethical considerations. The key ethical question that needs to be considered as part of the discussion on the future role of nuclear power is **whether** to create new waste; once new waste is created it would need to be managed and disposed of, in the same way as existing waste. We believe that the most appropriate way to consider both the public acceptability and ethical issues is as a part of the discussion of the wider climate change and energy security considerations.

93. Nuclear power could provide significant benefits to future generations, particularly in terms of reducing carbon emissions and contributing to energy security and thereby supporting economic growth. It is likely to be more cost effective than alternative forms of low-carbon generation²¹⁶. However, the creation of nuclear waste is also a potential burden while it requires active management or care and maintenance, and radioactive waste remains potentially hazardous for many years to come. This needs to be balanced against the likelihood that without new nuclear power, a greater proportion of the capacity needed to replace the existing nuclear and fossil fuel stations would come from additional fossil fuel power stations. Increasing the amount of fossil fuel plant would increase the emissions of carbon dioxide into the atmosphere, adding to the growing problem of man-made climate change. Further, a decision not to allow energy companies the option of investing in new nuclear power stations would mean that one less source of electricity generation would be available to future generations, which could have implications for future diversity and security of supply. The ethical issues around radioactive waste are discussed further in the CoRWM report on “Ethics and Decision Making for Radioactive Waste”²¹⁷ (although the discussions reported in that document focus primarily on legacy waste).

94. Allowing energy companies to build new nuclear power stations would create new radioactive waste that needs to be managed. Compared to the existing nuclear power stations in the UK, the designs of power stations that might be constructed would create less waste by volume because of the improved, more efficient reactor designs which use fewer components. Because of their longer expected lives, they would generate more electricity. However this means that there would be a larger increase in the radioactivity compared to the increase in volume of waste – principally from spent fuel – although as with all radioactive substances the activity would decline over time.

95. Scientific consensus and international experience suggests that waste from new nuclear power stations does not raise such different technical issues compared with nuclear waste from legacy nuclear programmes as to require a

²¹³ CoRWM statement on Nuclear New Build 16 December 2005, Addendum (March 2006).

²¹⁴ CoRWM statement on Nuclear New Build 16 December 2005.

²¹⁵ CoRWM’s *Managing our Radioactive Waste Safely* (CoRWM Document 700), CoRWM’s Recommendations to Government, July 2006. <http://www.corwm.org.uk/content-1092>

²¹⁶ DTI Cost Benefit Analysis of Nuclear Power, <http://www.dti.gov.uk/energy/whitepaper>

²¹⁷ Ethics and Decision Making for Radioactive Waste – CoRWM Document Number 1692.

different technical solution. It could therefore technically be accommodated in the same disposal facilities for intermediate level waste and high level waste/spent fuel as the existing legacy. If waste from new nuclear power stations were accommodated together with legacy waste, it would increase the overall size and cost of a geological disposal facility. However, it is likely that some of the initial infrastructure costs would be common to legacy and new wastes. The additional costs resulting from accommodating new build waste would arise principally from the construction of additional vaults.

96. The number of new nuclear power stations that energy companies might choose to build would have an impact on whether all of the new waste could be stored in the same repository as the legacy waste. The impact of the increase in the time during which the repository would need to remain open if waste from new nuclear power stations were to be added, would also need to be assessed. These issues would be addressed through the Managing Radioactive Waste Safely (MRWS) programme.

97. Placing waste in a geological repository is a long-term solution. CoRWM envisaged a facility being opened around the middle of this century, and receiving waste for several decades. In the meantime, waste from any new nuclear power stations would be managed in accordance with the Government's requirements and the NDA national strategy for interim storage. This is likely to require on-site storage in facilities capable of holding the waste in a safe condition for long periods until the waste repository is ready to receive it.

98. Any private sector developers of new nuclear power stations would be required to meet their full decommissioning and full share of waste management costs. In the report of the Energy Review, the Government established principles that would underpin arrangements to ensure that operators of nuclear power stations were obliged to accumulate sufficient and secure funds to cover these costs. The development of these robust financing arrangements is considered further in this consultation document. The arrangements would need to be agreed before proposals for new nuclear power stations could proceed.

99. The Government believes that new waste could technically be disposed of in a geological repository and that this would be the best solution for managing waste from any new nuclear power stations. The Government considers that waste should be stored in safe and secure interim storage facilities prior to a geological repository becoming available.

100. We consider that it would be desirable to dispose of both new and legacy waste in the same repository facilities and that this should be explored through the MRWS process.

101. There are also important ethical issues to consider around whether to create new nuclear waste, including the ethical implications of not allowing nuclear power to play a role, and the risks of failing to meet long-term carbon emissions targets. The Government has taken a preliminary view that the balance of ethical considerations does not require ruling out the option of new nuclear power. However, we intend that these ethical issues should be considered through this consultation document and respondents are invited to give their views.



Question 8

Do you agree or disagree with the Government's views on waste and decommissioning? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Question 9

What are the implications for the management of existing nuclear waste of taking a decision to allow energy companies to build new nuclear power stations?

Question 10

What do you think are the ethical considerations related to a decision to allow new nuclear power stations to be built? And how should these be balanced against the need to address climate change?

Environmental impacts of nuclear power

102. Nuclear power stations, like any other form of power station, affect the local environment and landscape. Construction, transport of materials, water usage for cooling, mining, fuel fabrication and the transmission of electricity also lead to environmental effects. Not all of these considerations are unique to nuclear power. Other electricity generating capacity, including renewables, can have an impact on the landscape and on local wildlife.

103. The land necessary to build a 1.2GW nuclear power station is estimated at 25-75 hectares, compared to 100 hectares for a 1.8GW coal-fired power station²¹⁸, although additional space could be required to fit carbon capture and storage technology to a coal-fired power station. This compares to estimates by the British Wind Energy Association of 1,000 hectares for a 1GW windfarm²¹⁹.

104. An opportunity to assess and mitigate the environmental and landscape impacts of new power stations is through the electricity development consents process, which considers these issues in detail and provides an opportunity for public involvement in the process. The Government's recent white paper "Planning for a Sustainable Future" proposes reforms to the planning system for nationally significant infrastructure²²⁰. As part of the existing and proposed process, developers have to prepare a detailed Environmental Impact Assessment.

105. As with all energy infrastructure developments, it would be for private sector energy companies to decide where to put forward proposals for any new nuclear power stations, if the Government concludes after this consultation that they should be allowed to make such investments. Industry has indicated that the most viable sites are likely to be adjacent to existing nuclear power stations.

106. The Government proposes to undertake a strategic siting process to develop criteria for determining the suitability of sites. This strategic assessment would consider the high-level environmental impacts of new nuclear power stations. More information on detail of this assessment is in the accompanying consultation document on the detail of this proposal²²¹.

218 <http://www.publications.parliament.uk/pa/cm198889/cmhansrd/1989-02-03/Writtens-2.html>

219 <http://www.bwea.com/ref/faq.html#space>

220 <http://www.communities.gov.uk/planningwhitepaper>

221 <http://www.dti.gov.uk/energy/whitepaper/consultations/nuclearpower2007>

107. **The Government believes that the environmental impacts of new nuclear power stations would not be significantly different to other forms of electricity generation and given the UK and European requirements in place to assess and mitigate the impacts, that they are manageable. Therefore, the Government believes that they do not provide a reason to not allow energy companies the option of investing in new nuclear power stations.**

108. **We recognise the need for a strategic assessment of the environmental issues relating to new nuclear power stations. If the Government confirms its preliminary view that it is in the public interest to allow energy companies the option of investing in new nuclear power stations, we propose to undertake an SEA as part of a Strategic Siting Assessment, the detail of and proposed timetable for which is set out in a detailed consultation alongside this consultation on the issue in principle.**

Question 11

Do you agree or disagree with the Government's views on environmental issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The supply of nuclear fuel

109. The UK does not have readily available indigenous sources of fuel for nuclear power stations and imports most of the uranium for the existing nuclear power stations from Australia. Therefore, in the context of increasing international demand for energy, we have considered availability and access to fuel. The IAEA/OECD estimate that conventional uranium resources that can be mined for less than \$130kg/uranium (about \$60/lb), roughly the average price in 2006²²², would last for 85 years based on the world's nuclear electricity generating capacity in 2004²²³. Much of these reserves are in Australia and Canada.

110. Since 2000, uranium prices have increased significantly. However, the price of nuclear fuel represents a much smaller part of the cost of electricity than it does for other generating technologies, so these price rises have not had a material impact on overall generating costs. The increasing price of uranium will make more of the reserves that have already been discovered economic to extract. It also provides an incentive for further exploration. On the basis of newly discovered reserves, there is no evidence to suggest that we will need to mine significantly lower-grade ores²²⁴, in which case carbon lifecycle emissions of nuclear generation should not materially change.

111. **Based on the significant evidence that there are sufficient high-grade uranium ores available to meet future global demands, and the relatively small impact that allowing energy companies to invest in new nuclear power stations in the UK would have on global demand for uranium, the Government believes that there should be sufficient reserves to fuel any new nuclear power stations constructed in the UK.**

²²² http://www.cameco.com/investor_relations/ux_history

²²³ NEA and IAEA, *Uranium 2005: Resources, Production and Demand*, 2006 (The "Red Book")

²²⁴ NEA and IAEA, *Uranium 2005: Resources, Production and Demand*, 2006 (The "Red Book")



Question 12

Do you agree or disagree with the Government's views on the supply of nuclear fuel? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Supply chain and skills capacity

112. As the demand grows globally for new power stations of any technology, there could be shortages in the capacity to supply some of the components and shortages of the human skills needed to build them.

113. Proposals by industry to build significant numbers of new nuclear power stations would require a strengthening of the science, engineering, project management and on-site trade/technician skills base in the medium term²²⁵. Industry would also need to train a new operations workforce over the course of construction.

114. If nuclear power is to be viable, the market needs to respond to interest from firms in developing new nuclear power stations by increasing its ability to meet rising demand. The long lead times for nuclear power stations allow time for industry to plan ahead through such measures as placing early contracts well in advance to secure slots in manufacturers' order books for the production of certain components, and for training and recruitment. Such moves could reduce the risks that industry will suffer from shortages of skills and a lack of capacity in the supply chain. Furthermore, the work of the Sector Skills Council is supporting skills development²²⁶. Initiatives such as the Nuclear Skills Academy and new higher-education programmes should also help to maintain the UK's skills base in nuclear science and technology.

115. **The Government believes that the international supply chain and skills market should be able to respond if the Government were to allow energy companies to invest in new nuclear power stations. This view is based on:**

- **the long lead times associated with new nuclear power stations;**
- **the financial incentives for the private sector to meet the demands created by the building of new nuclear power stations; and**
- **the facilitative work that Government, the academic sector and industry are undertaking to support skills development in the relevant sectors.**

Therefore, the Government believes that the supply of skills and supply chain capacity do not provide a reason to prevent energy companies from investing in new nuclear power stations.

Question 13

Do you agree or disagree with the Government's views on the supply chain and skills capacity? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

²²⁵ Nuclear Employers Survey 2005, http://www.cogent-ssc.com/research_and_policy/LMI_and_reports/Nuclear_Employers_Survey.pdf

²²⁶ A Skill Needs Assessment for the Nuclear Industry, <http://www.cogent-ssc.com/pdf/SNA/Nuclear.pdf>

Reprocessing of spent fuel

116. Nuclear power stations generate radioactive waste and spent fuel. Spent fuel may either be disposed of or recycled to separate out the useful uranium and plutonium. In some cases reprocessing can help to manage safety and environmental risks, for example there is no proven alternative to reprocessing fuel from the early Magnox reactors in the UK, which cannot be stored long-term in water. However, reprocessing also raises particular concerns about the creation of separated plutonium which would require the long-term storage, the management of associated waste streams, which in the UK include regulated radioactive discharges to the Irish Sea, and the transport of spent fuel and nuclear materials.

117. The private sector has made no proposals to reprocess spent fuel from any new nuclear power stations.

118. The Government has concluded that any nuclear power stations that might be built in the UK should proceed on the basis that spent fuel will not be reprocessed and that accordingly waste management plans and financing should proceed on this basis.

Question 14

Do you agree or disagree with the Government's views on reprocessing? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

Other considerations

119. We recognise that making a decision on the potential role of nuclear power is a complex issue, and that there are many issues that need to be considered.

Question 15

Are there any other issues or information that you believe need to be considered before taking a decision on giving energy companies the option of investing in nuclear power stations? And why?

Our proposals on nuclear power

120. The Government is not itself proposing to build nuclear power stations. We have, however, reached the preliminary view that private sector energy companies should have the option of investing in new nuclear power stations, subject to the following conditions:

- the developer preparing an environmental Impact Assessment²²⁷ and securing development consent;
- the developer securing the necessary permissions from the independent regulators to ensure that the nuclear power station could be operated safely, securely and without detriment to public health;
- a decision by the Secretary of State, that the proposed design is Justified (in accordance with the Justification of Practices Involving Ionising Radiation Regulations 2004)²²⁸;

²²⁷ in accordance with the "EIA Directive" 85/337/EEC

²²⁸ Justification is a high-level assessment to determine the benefits and detriments associated with a particular class or type of nuclear practice. Before a new class or type of practice can be introduced into the UK, it must be justified.



- the proposal being in a site that meets the suitability criteria as identified through a Strategic Siting Assessment. This Assessment would also meet the requirements for a Strategic Environmental Assessment (in accordance with EC Directive 2001/42);
- the establishment, in legislation, of arrangements to protect the taxpayer and ensure that energy companies meet their full decommissioning costs and full share of waste management costs. These would need to be agreed before proposals for new nuclear power stations could proceed. As with the existing nuclear power stations, there is a potential Government liability in accordance with international Conventions to cover third party damages in the unlikely event of a major accident;
- a decision that the management of waste arising from new nuclear power stations would be explored through the Managing Radioactive Waste Safely (MRWS) process.

121. Within this framework, we think it is likely that energy companies will come forward with proposals for new nuclear power stations, although we cannot predict this with certainty. Their decisions will be affected by their view on the underlying costs of new investments, their expectations of future electricity, fuel and carbon prices, expected closures of existing power stations and the development time for new power stations. We cannot know all of these things today and believe we should reflect this uncertainty by having a diversified approach in our energy policy. This will reduce the risks associated with this uncertainty, for example, by preventing over-reliance on a limited number of technologies.

122. The Government believes that, given the many uncertainties in the energy market over the coming decades, not allowing energy companies the option of investing in new nuclear power stations would increase the risks of not achieving our long-term climate change and energy security goals, and if we were to achieve them, it would be at higher costs.

123. Having reviewed the evidence, the Government's preliminary view is that the advantages of giving the private sector the widest choice of investment options, including nuclear power stations, outweigh the disadvantages. Moreover, we believe that through the regulatory protections already in place, and other risk mitigation approaches described in this document, the risks can be effectively managed.

Question 16

In the context of tackling climate change and ensuring energy security, do you agree or disagree that it would be in the public interest to give energy companies the option of investing in new nuclear power stations?

Question 17

Are there other conditions that you believe should be put in place before giving energy companies the option of investing in new nuclear power stations? (for example, restricting build to the vicinity of existing sites, or restricting build to approximately replacing the existing capacity)

Our proposals for facilitative action

124. If we conclude that energy companies should be allowed to invest in new nuclear power stations, the Government would carry out a package of facilitative action designed to reduce the regulatory and planning risks associated with investing in nuclear power stations.

125. The package of measures is designed to reduce the uncertainties in the pre-construction period for new nuclear power stations through improvements to the regulatory and planning processes. The measures will also set out arrangements for the funding of decommissioning and waste management and disposal. The proposed package of measures covers:

- taking steps to improve the process for granting planning consent for electricity developments by ensuring it gives full weight to national, strategic and regulatory issues that have already been the subject of discussion and consultation. This could take the form of a National Policy Statement, consistent with the reforms proposed in the 2007 Planning White Paper²²⁹. We would:
 - develop criteria for suitable sites for new nuclear power stations through a Strategic Siting Assessment, subject to relevant European and domestic legislative requirements; and
 - continue our consideration of the high-level environmental impacts through a formal Strategic Environmental Assessment in accordance with the SEA Directive²³⁰. Applicants for specific proposals would still need to carry out a full Environmental Impact Assessment;
- running a process of “Justification” (in accordance with the Justification of Practices Involving Ionising Radiation Regulations 2004);
- the nuclear regulators pursuing a process of Generic Design Assessment²³¹ of industry preferred designs of nuclear power stations to complement the existing licensing processes. This would consist of an assessment of the safety and security of power station designs and their radiological discharges to the environment; and
- developing arrangements that would protect the taxpayer by ensuring that private sector operators of nuclear power stations securely accumulate the funds needed to meet the full costs of decommissioning and full share of waste management costs. This would need to be agreed before proposals for new nuclear power stations could proceed.

²²⁹ *Planning for a Sustainable Future*, May 2007, <http://www.communities.gov.uk/planningwhitepaper>

²³⁰ European Directive 2001/42/EC.

²³¹ This is sometimes referred to generically as “pre-licensing”.



126. The power to consent to the construction of power stations greater than 50MW capacity has been executively devolved to Scottish Ministers and is also devolved in Northern Ireland. In developing the proposals above we will need to take account of any areas in which the Devolved Administrations have competence.

Question 18

Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments? Are there any other measures that you think the Government should consider?

127. The Government has previously consulted on a similar package of proposals, through the July 2006 consultation on a Nuclear Policy Framework. Because the proposal has been refined, we are consulting again on this issue. If respondents would like us to reconsider their responses to that consultation, then they should indicate this in their response to this consultation.

128. Alongside this in-principle consultation, there is a linked technical consultation on the details of running a Justification process and a Strategic Siting Assessment. Respondents to this consultation may wish to consider the information brought forward in this consultation²³².

129. If after these consultations, we confirm our preliminary view that energy companies should be allowed to invest in new nuclear power stations, we will set this out in a further Energy White Paper later this year.

130. In summer 2007, the Government will also be launching a consultation on proposals for implementing the Committee on Radioactive Waste Management's recommendations for geological disposal of higher activity radioactive wastes as part of the Managing Radioactive Waste Safely (MRWS) programme. This consultation will specifically consider the geological repository development programme and site selection process. The consultation is expected to launch in June 2007. Respondents to this consultation may want to see the more detailed information on geological disposal that will be published in the MRWS consultation before responding to this consultation.

Proceeding with facilitative action on a contingent basis

131. There is a limited window for replacing a significant amount of our existing electricity generating capacity. Energy companies will need to invest in around 30-35GW of new electricity generating capacity – as coal and nuclear plants retire – over the next two decades, with around two-thirds needed by 2020. This is equivalent to about one third of our existing capacity. We know that there is an urgent need to tackle climate change.

²³² <http://www.dti.gov.uk/energy/whitepaper/consultations/nuclearpower2007>

132. New nuclear power stations have long lead times. This time is necessary to secure the relevant regulatory and development consents which must be obtained before construction can begin, but there is also a long construction period compared to other generating technologies²³³.

133. New nuclear power stations are therefore unlikely to make a significant contribution to the need for new capacity before 2020. Even with our expectation that the share of renewables will grow, it is likely that fossil fuel generation will meet some of this need.

134. However, beyond that date there are still significant amounts of new capacity needed; for example in 2023 one third or 3GW of our nuclear capacity will still be operational, based on published lifetimes. Given the likely increase in fossil fuel generation before this date, it is important that as much of this capacity as possible is replaced with low carbon technologies. Nuclear power stations could make an important contribution to this need and make a contribution to our energy security.

135. However, without early clarity on the Government's policy, we will foreclose the opportunity for nuclear power because of the long lead times. There will not be a time when climate change and energy policy will stop evolving and adapting. Meeting our energy challenges will require changes to the UK energy system, it is important that we make progress now.

136. We therefore believe it is prudent to start working on this facilitative action now, on a contingent basis, so that no time is wasted if we do conclude that nuclear power has a role to play. We will therefore be starting work on some of these activities, in particular on the Generic Design Assessment process and the arrangements for waste and decommissioning funding, on a contingent basis alongside this consultation. We will review whether to continue with this work in the light of the consultation responses.

RESPONDING TO THIS CONSULTATION

Consultation Questions

This document sets out a summary of the key challenges of tackling climate change and ensuring energy security that the UK faces:

1. To what extent do you believe that tackling climate change and ensuring the security of energy supplies are two key challenges for the UK that require significant action in the near term and a sustained strategy between now and 2050?

The document also sets out the evidence and information that we have considered and the preliminary conclusions that we have reached following our assessment of this evidence. We invite respondents to consider the evidence we have presented, and to comment on the following questions:

²³³ Our conservative assumption is that for the first new nuclear plant the pre-construction period would last around 8 years (to secure the necessary consents) and the construction period would last around 5 years. For subsequent plants this is assumed to be 5 and 5 years respectively.



2. Do you agree or disagree with the Government's views on carbon emissions from new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
3. Do you agree or disagree with the Government's views on the security of supply impact of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
4. Do you agree or disagree with the Government's views on the economics of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
5. Do you agree or disagree with the Government's views on the value of having nuclear power as an option? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
6. Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
7. Do you agree or disagree with the Government's views on the transport of nuclear materials? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
8. Do you agree or disagree with the Government's views on waste and decommissioning ? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
9. What are the implications for the management of existing nuclear waste of taking a decision to allow energy companies to build new nuclear power stations?
10. What do you think are the ethical considerations related to a decision to allow new nuclear power stations to be built? And how should these be balanced against the need to address climate change?
11. Do you agree or disagree with the Government's views on environmental issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?
12. Do you agree or disagree with the Government's views on the supply of nuclear fuel? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

13. Do you agree or disagree with the Government's views on the supply chain and skills capacity? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

14. Do you agree or disagree with the Government's views on reprocessing? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The purpose of this major consultation exercise is to provide interested parties with information on nuclear power, and to assist parties to reach an informed view on the future of nuclear power in the UK. Based on the responses and evidence gathered during this consultation, we will consider whether it is appropriate to confirm our preliminary view as Government policy, and to allow energy companies to invest in new nuclear power stations.

15. Are there any other issues or information that you believe need to be considered before taking a decision on giving energy companies the option of investing in nuclear power stations? And why?

In their responses to the consultation, we encourage parties to include the reasoning behind their conclusions and any evidence that supports their views. In reaching a conclusion on the future of nuclear power, we will assess the responses to this consultation and the evidence and information that it brings forward.

16. In the context of tackling climate change and ensuring energy security, do you agree or disagree that it would be in the public interest to give energy companies the option of investing in new nuclear power stations?

17. Are there other conditions that you believe should be put in place before giving energy companies the option of investing in new nuclear power stations? (for example, restricting build to the vicinity of existing sites, or restricting build to approximately replacing the existing capacity)

Alongside this in-principle consultation, there is a linked technical consultation on the details of running a Justification process and a Strategic Siting Assessment. Respondents to this consultation may wish to consider the information brought forward in these consultations²³⁴.

18. Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments? Are there any other measures that you think the Government should consider?



How to respond

This consultation seeks views on the information and arguments set out on whether the private sector should be allowed the option of building new nuclear power stations.

We want to hear from members of the public, industry, non-Governmental organisations (NGOs) or any other organisation or public body.

We are seeking views on whether the Government has considered the relevant arguments; whether we have considered the arguments reasonably and whether there are other important arguments we have overlooked. Your views will contribute to the shaping of the policy on the future of civil nuclear power in the UK. They will help Government assess the arguments before it reaches its final decision on the future of new nuclear build.

We will consider carefully the responses we get and this will enable us to take a decision on nuclear power later in the year.

The Government will give greater consideration to the arguments and evidence than to simple expressions of support or opposition to new nuclear power stations when considering responses to this consultation and whether to confirm our preliminary view.

The consultation began on 23 May 2007 and will close on 10 October 2007.

There are a number of ways to let us know your view.

Online

Visit our website at <http://www.direct.gov.uk/nuclearpower2007>. The online consultation has been designed to make it easy to submit responses to the questions. On registration you will be provided with a user name and password to enable you to edit or update your submission as many times as you wish whilst the consultation is open.

By letter, fax or email

A response can also be submitted by letter, fax or email to:

Response – Nuclear Power Consultation 2007
FREEPOST SEA 12430
Thornton Heath
CR7 7XT

Tel: 020 7215 3331

Fax: 020 8683 6601

Email: response@nuclearpower2007.org.uk

If you are responding on paper you can use the response form which is available on request by contacting the DTI Publications Orderline (the address is on page 37).

Additional points about this consultation

When responding please state whether you are responding as an individual or representing the views of an organisation. If you are responding on behalf of an organisation, please make it clear who the organisation represents and, where applicable, how you assembled the views of members. The website registration form provides space to do this.

After the consultation has closed, all responses (including respondents' names) will be published unless respondents specifically request that their responses be kept confidential. This will apply to all responses whether submitted online, posted, faxed or emailed. Please indicate on your response if you want us to treat it as confidential. You should also read the section on confidentiality and data protection.

The deadline for responses is 10 October 2007.

Consultation events

In addition, over the next few months we want to meet with representatives from NGOs, industry, local authorities and many other organisations. These meetings will enable us to explore in more detail the views of interested parties.

We will also be hosting a number of regional deliberative events across the UK for members of the public. These events provide an opportunity for the public to input their considered and informed views. They will enable us to understand the views of the public after they have heard the key facts and arguments in the consultation. Discussion at the events will address the same key questions in the consultation document. The public will be recruited to be demographically representative of the UK population. Recruitment will be through direct invitation of randomly selected households on selected electoral registers.

Summaries of the events will be published on our website when available during the consultation.

Confidentiality and Data Protection

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004).

If you want other information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for



disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the DPA and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

Additional copies

You may make copies of this document without seeking permission. Further printed copies of the consultation document or copies of the response form can be obtained from:

DTI Publications Orderline
ADMAIL 528
London SW1W 8YT

Tel: 0845 015 0010
Fax: 0845 015 0020
Minicom: 0845 015 0030
<http://www.dti.gov.uk/publications>

Copies of the document in Welsh, Braille, large print and audio are also available on request from the Orderline. An electronic version can be found at <http://www.direct.gov.uk/nuclearpower2007>. A Welsh version of the document will be available at the same address.

Help with queries

Questions about the policy issues raised in the document can be addressed to:

Query – Nuclear Power Consultation 2007
FREEPOST SEA 12430
Thornton Heath
CR7 7XT

Tel: 020 7215 3331
Fax: 020 8683 6601
Email: query@nuclearpower2007.org.uk

Taking part in other related consultations

As we explain in the Executive Summary, there are a number of other consultations which you may want to find out more about:

- Alongside this in-principle consultation, there are linked technical consultations on the proposed Justification and Strategic Siting Assessment processes. You can take part in these by visiting the website <http://www.direct.gov.uk/nuclearpower2007>. Alternatively you can request a copy of the document by contacting the DTI Publications Orderline.
- Managing Radioactive Waste Safely (MRWS) Consultation. This consultation will specifically consider the proposed implementation framework for the geological disposal of the UK's higher activity radioactive waste including the approach to site selection. The consultation is expected to launch in June 2007. Respondents to this consultation may want to see the more detailed information on geological disposal that will be published in the MRWS consultation before responding to this consultation. You can take part in this by visiting <http://www.defra.gov.uk> or by phoning the Defra Helpline on 08459 33 55 77 or emailing radioactivewaste@defra.gsi.gov.uk.



Research and Development, Demonstration and Deployment, and Skills

Our move to a secure and low carbon economy requires the development of technologies, products and processes to reduce the carbon emissions from energy. We need to harness cleaner sources of energy, such as wind, waves and tides, and find ways to decarbonise fossil fuels, including through more efficient production and use. We also need skilled people to develop, install and operate these technologies. Without these developments we will be unable to meet our carbon reduction goals and we will have fewer sources of energy to rely on within our energy mix. The Stern Review²³⁵ notes that policy to support innovation and the deployment of low carbon technologies will be a key response to mitigating climate change. Stern also identifies a range of important associated actions to support increased take-up of new technologies including effective carbon pricing and removing barriers to innovation.

6.1 The Government and industry are already investing in low carbon energy technologies and we will continue to work together to overcome the barriers to development and deployment. The development and deployment of new technologies requires effective infrastructure, well-targeted funding, and the skills to bring forward a low carbon energy future.

6.2 Without support new energy technologies are unlikely to develop within the timescales necessary to reduce the risks of climate change. There are several reasons for this. Firstly, there are significant costs and risks in energy technology innovation including the long time periods involved in development. Secondly, it is difficult for new technologies to displace existing energy sources which are usually cheaper to produce and often benefit from the economies of scale from widespread deployment. Thirdly, displacing existing technologies is made all the more difficult if the cost of carbon is not adequately reflected in the price we pay for energy.

6.3 The objective of Government support is therefore to promote the development of new technologies from initial concept to the point where they can be deployed commercially. On its own, the private sector may not invest adequately, particularly in R&D, because individual companies cannot always



capture sufficient returns relative to the costs and risks involved. This is demonstrated by the fall in energy R&D since privatisation. The Government's role is to address this market failure and facilitate a level of spending that reflects wider economic benefits.

6.4 This chapter sets out:

- the benefits of developing new low carbon technologies and more efficient production and use of energy;
- how low carbon technologies, products and processes are developed and the new and existing funding programmes in place to support this;
- the objectives of the new Energy Technologies Institute and the Environmental Transformation Fund; and
- the challenges the energy sector faces in terms of longer-term skills development and the actions being taken to address them.

The benefits of development of low carbon technologies

6.5 Taken together, low carbon energy technologies now supply roughly 25% of the UK's electricity (4.6% excluding nuclear)²³⁶, and less than 1% of our heat and transport fuels. If we can drive the development of low carbon technologies there could be many benefits beyond the obvious emissions reductions, including:

- **Reducing security of supply risk** – Diversity in the energy mix is important to security of supply as it spreads the risk across a range of technologies and reduces over-reliance on one particular source of energy.
- **Innovation and wealth creation** – Technology developments can bring opportunities for UK companies. The focus of applied research through the DTI's Technology Programme is wealth creation through innovation, and that programme and its predecessor have supported UK companies on the path to bringing energy technology developments to market. This will be continued through the Energy Technologies Institute and the Technology Strategy Board (see paragraphs 684 and 690). In addition, the Government has established the Commission on Environmental Markets and Economic Performance (CEMEP) which will report later this year. It will make recommendations on how the UK environmental goods and services industry can make the most of the opportunity that environmental protection can present for wealth creation and employment growth²³⁷.
- **Supply chain and service companies opportunities** – Deployment of technologies that have overcome the technical hurdles brings opportunities for service organisations, from small scale installers of microgeneration technologies through entrepreneurial project developers to the major construction and finance houses required to develop offshore wind farms. Some technologies create business opportunities by bringing together new groupings of existing industries, for example carbon capture and storage where utilities, oil companies and process plant design experts are developing new relationships.

²³⁶ DTI: *Digest of UK Energy Statistics*, 2006.

²³⁷ A recent joint DTI/Defra report estimates that the UK environmental goods and services industry has the potential to increase its turnover to more than £34 billion by 2010 and £46 billion by 2015 (<http://www.dti.gov.uk/sectors/environmental/index.html>). CEMEP's membership is drawn from Government, business, NGOs, academia, trade unions and public sector organisations.

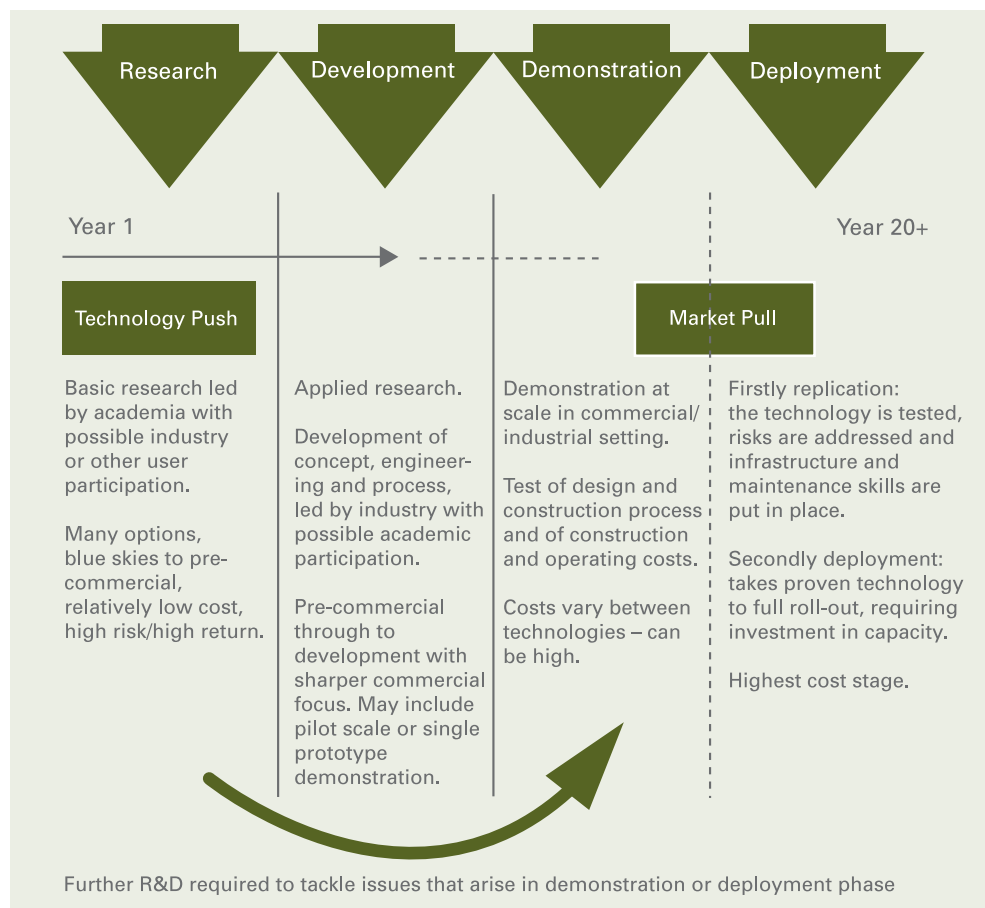
- **Informing our international strategy to drive rapid deployment globally of low carbon technologies** – Development and deployment of low carbon technologies in the UK contributes to our international climate change objectives. We build on experience and expertise in the UK to develop our strategy overseas, establishing relationships at both a strategic and technical level. These relationships influence the international debate on new carbon technologies and help to facilitate the cost-effective roll-out of technologies globally. International energy technology issues are covered in more detail in chapter 1, which gives examples of projects where the UK is collaborating with other countries to roll out new technologies.

The innovation system

6.6 All technologies broadly go through the same stages of development: research through to deployment, which collectively constitutes the innovation system (see Figure 6.1 below). In reality, the innovation system is far less linear than implied by Figure 6.1. For example a project at the demonstration and deployment stages may have further need for research and development. Support for the research, development and demonstration of new technologies forms the technology push aspect of innovation.

6.7 Market pull comes by providing the market mechanisms and incentives that help create the demand for the wider deployment of new technologies. One of the most obvious examples is the Renewables Obligation which has been very effective at deploying new renewables technologies to produce electricity; there is now over 2GW of wind power connected to the grid.

FIGURE 6.1. THE INNOVATION SYSTEM





6.8 The Government's aim is to speed the development and deployment of sustainable and affordable low carbon technologies which can help cut carbon dioxide emissions. Our strategy, both nationally and globally, is based on:

- building credible long-term policy frameworks for tackling climate change to provide clear long-term signals to industry which will shape their investment decisions (such as carbon pricing through the EU Emissions Trading Scheme) Also, through the draft Climate Change Bill, the UK is setting a target to reduce emissions by 60% by 2050, with a reduction of 26-32% by 2020;
- enabling private sector investment by setting direction and providing direct support for innovation. This creates and develops new technologies that have the potential to be rolled out affordably on a wide scale; and
- intervening to address other market failures through a stable framework of policies and incentives. This includes providing the right framework of legislation and economic incentives to encourage development investment. The Government can also put in place systems to enable technology collaboration and policies to overcome specific barriers to development, which can range from awareness-raising to identifying common standards and supply chain development.

6.9 As well as developing their viability, Government support also aims to reduce the costs of producing energy from technologies. Emerging technologies begin at a higher point on the cost curve. Over time the costs are expected to fall to the point where they become competitive with existing technologies, taking into account market pull measures such as the EU ETS.

6.10 The UK is focusing support on technologies that have the potential to produce cost-effective clean energy for use in producing electricity, heat or fuels for transport²³⁸, and to help us use energy more efficiently.

Developing low carbon energy technologies

6.11 Low carbon technologies apply to all energy sectors; they can be large or small scale, and are for use by individuals, households, communities, business and the public sector. Key technologies include those already at or near commercial deployment (including renewables, fuel cells, and improved combustion technologies for fossil fuel and nuclear) and also those that will enable our move to a low carbon economy over the longer-term (such as carbon capture and storage, hydrogen, advanced biofuels, solar electricity, wave and tidal, and nuclear fusion).

6.12 New technologies can also help us to use energy more efficiently, by improving the efficiency of buildings, vehicles, power generation and distribution. Advanced demand management techniques allow us to monitor and regulate the use of energy, from smart meters in the home to the wide-scale distribution of electricity. Innovation can help us to use less energy by improving the efficiency of products. New technologies involving insulation could improve the emissions from buildings (the UK housing stock is currently responsible for around 27% of all carbon emissions in the UK). Further details on saving energy can be found in chapter 2.

²³⁸ The Low Carbon Transport Innovation Strategy is detailed in chapter 7.

6.13 Innovation in electricity networks is also required in order to allow renewable generation to access the electricity grid more quickly, maximise the utilisation of existing network assets, and generally manage the transmission and distribution of electricity more efficiently. A characteristic of some renewable electricity sources is that their output will vary, for example according to the strength of the wind. Innovation can help overcome the challenge of managing the impacts of this variability efficiently and at minimum cost.

6.14 The emerging technologies which could offer the most potential to the UK are shown in Table 6.1. This also indicates the stage of development of each of them. The development timescales in some cases are long, covering decades rather than years.

TABLE 6.1. EMERGING TECHNOLOGIES IN THE UK

Technology	Potential uses	Development stage
Offshore wind	For electricity	Early deployment stage. Further R&D is underway to help cost reduction
Bioenergy	For heat, transport and electricity (both dedicated biomass electricity and co-fired with coal)	Many proven technologies in deployment stage. Second generation technologies in early stages
Wave and tidal	For electricity – tidal barrage could also be integrated with transport infrastructure and coastal protection	Leading wave and tidal-stream technologies at demonstration stage. Tidal barrage is a mature technology
Microgeneration technologies (solar photovoltaics (PV) and water heating, micro-wind, micro-hydro, heat pumps, biomass, micro-CHP and small-scale fuel cells)	For heat and/or electricity to homes, community buildings, small commercial and public sector premises	Most technologies are proven and in the deployment phase. Micro-CHP (Combined Heat and Power) and small-scale fuel cells are at earlier stages



TABLE 6.1. Continued

Technology	Potential uses	Development stage
Hydrogen and fuel cells	Fuel cells – distributed stationary power generation, CHP, transport, portable power. Hydrogen – transport, heating, and possibly balancing intermittent renewables for power generation in remote situations	Fuel cells for portable power in, e.g. laptops and mobile phones are at early deployment stage. Other technologies are at the early demonstration phase and further R&D is required to deliver major cost reductions and improved performance
Carbon abatement technologies	For electricity generation. Efficiency improvements, and carbon capture and storage (CCS)	No commercial-scale CCS power stations have been developed yet in any country, although elements of the individual stages of the process have been demonstrated
Research technologies	For electricity, heat or transport	Technologies still in research e.g. next generation solar PV and, alternative ways to harness solar energy, biofuel cells, nuclear fusion
Demand management technologies	Technologies such as products, materials, networks and storage that use energy more efficiently for electricity, heat or transport	Products and processes at various stages of development; for example smart domestic metering at the early deployment stage
Battery technologies	For use in vehicles with hybrid systems as well as fully battery driven	Partial to full hybrid systems currently entering the market, purely battery vehicles at the demonstration phase or in niche applications

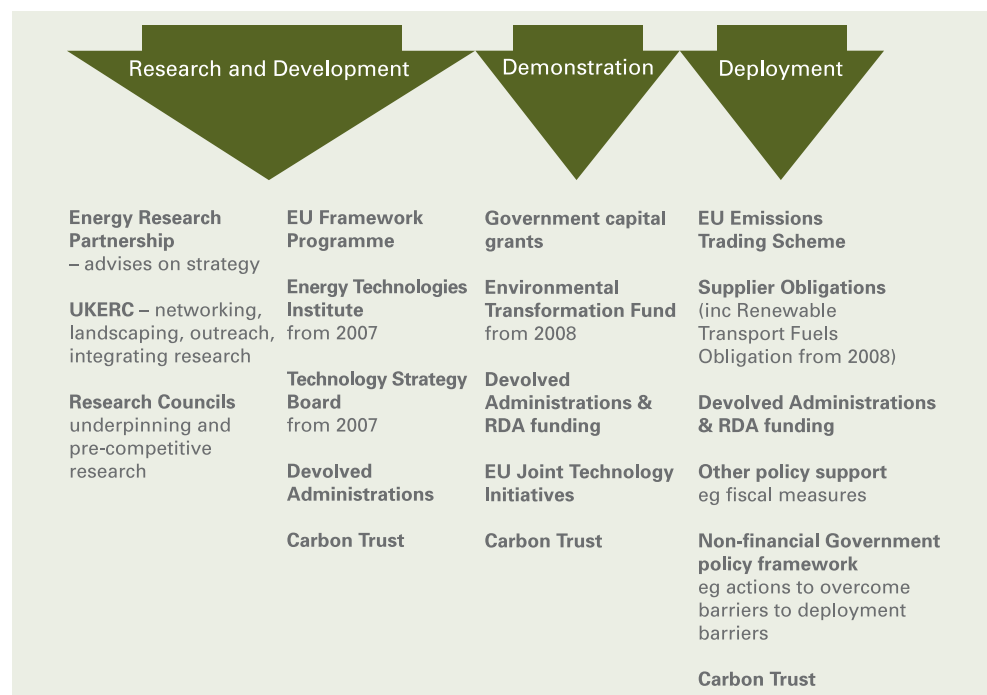
Energy technology support mechanisms

6.15 The Government strategy to develop low carbon sources of energy is devised and delivered in conjunction with a wide range of bodies including the private sector and academia. Different organisations work together to provide strategic advice, financial support and a coherent framework of policy and action in this area, both domestically and internationally. The Government sets the overall strategic direction: by ensuring that each part of the innovation system works effectively with the whole system and bringing together participants to set common goals; by setting the level of public funding to leverage the investment from the private sector; and by working to expand research and industrial capacity.

6.16 An important element of this work is to promote development and deployment of low carbon energy technologies globally. Almost all of the organisations and programmes discussed below are actively engaged in international collaboration with both developed and developing countries. For example, the Research Councils run joint programmes with developing countries for collaborative R&D, and both the new Energy Technologies Institute and the Environmental Transformation Fund have strong internationally focussed aims. The UK has initiated the joint EU-China project to build a commercially viable near-zero emissions coal power station in China (NZE) with funding from the EU and UK. Further details on NZEC are provided in chapter 1.

6.17 Government support for energy innovation is rising sharply. In summer 2007 we shall be launching the new Energy Technologies Institute, with a minimum budget of around £600 million over the next decade for R&D into low carbon energy, drawing on private as well as public funding. The Environmental Transformation Fund will be established from April 2008. Figure 6.2 sets out the main support mechanisms. It also shows the public sector bodies that work together, and with the private sector, to support the energy innovation system. The organisations are shown under their main area of operation, although some operate across several parts of the innovation system.

FIGURE 6.2 ENERGY INNOVATION – KEY PUBLIC SECTOR PARTICIPATION



6.18 The **Energy Research Partnership** was established in January 2006 to bring together key organisations across Government, the research community and business. The Partnership is a key senior level forum where UK participants in low carbon energy innovation, including most of those shown in the table above, come together to maximise the impact and coherence of the UK's investments in all aspects of energy innovation, extending from fundamental research through to support for the deployment of emerging low carbon technologies in the market place.



6.19 The Partnership has been instrumental in developing the Energy Technologies Institute (see paragraph 684). Other work has focused on identifying priorities for UK R&D, and on exploring key training and skills issues. Its report on high-level skills shortages in the energy sector was published in March 2007²³⁹.

Innovation system support mechanisms – Research and Development

6.20 The UK Energy Research Centre (UKERC) was established in 2004 following the 2002 Energy Review. With funding of £13.8 million over 2004-9, its objective is to provide a focus for energy research in the UK and for international collaboration. UKERC organises outreach, networking and integrating research activities with the involvement of research institutions across the UK. The UKERC Energy Research Atlas and National Energy Research Network were launched in October 2006.

6.21 The Research Councils' Energy Programme brings together within one framework all the Research Council activities on energy R&D and postgraduate training. The programme is led by the Engineering and Physical Sciences Research Council (EPSRC) and supports a full spectrum of energy research to help meet the UK's energy policy objectives, working to expand international collaboration and UK research capacity in energy-related areas. The programme has a high level of business and other user engagement. Current consortia delivering the programme include work in marine energy, solar pv, hydrogen (including storage and solar production), fuel cells (including biofuel cells), bioenergy, carbon capture and storage, wind, transmission and distribution (including the inclusion of intermittency and distributed generation), energy storage, conventional plant and nuclear fission. There are also teams working on energy demand reduction in buildings and in industry and on understanding the links between lifestyle, societal values and the environment. EPSRC funds the UK fusion programme (see Box 6.1). Research Council's expenditure on energy-related basic, strategic and applied research and related postgraduate training is planned to rise to over £70m by 2007-8.

BOX 6.1 RESEARCH AND DEVELOPMENT INTO NUCLEAR FUSION

Research is underway on nuclear fusion which may emerge as a major new source of energy in the longer term. A fusion power station would create no greenhouse gases nor other polluting emissions during its operation and no long-lived radioactive waste. Fusion uses basic fuels which are abundant and widely available – hydrogen (from water) and lithium. It is generally thought that technical feasibility of fusion power generation could be demonstrated within 25 years given adequate resources, with full-scale power generation in a prototype power plant within 30-35 years.

Fusion has been achieved in JET (the Joint European Torus) in Culham, Oxfordshire, and has resulted in the release of significant amounts of fusion energy in a controlled manner for very short periods. JET, which began operation in 1983, is the flagship of the European Fusion Programme.

²³⁹ Energy Research Partnership, *Investigation into high-level skills shortages in the energy sector*, March 2007 <http://www.energyresearchpartnership.org/files/ERP-Skills-Brochure.pdf>

BOX 6.1 Continued

Knowledge gained from JET is a valuable input into design of ITER (International Thermonuclear Experimental Reactor), a new experimental fusion facility to be built in France. ITER will aim to demonstrate the physics and engineering of fusion at the scale of a power station. International collaboration is the best way of addressing the complex science and technology questions and the scale of resources required in order to harness nuclear fusion. The seven parties co-operating on ITER are China, EU, India, Japan, Russia, Republic of Korea, and the US. The UK is participating through its membership of the European Atomic Energy community (EURATOM).

6.22 Applied research in the development stage benefits from substantial and increasing UK and EU sources of funding. See chapter 1 for information on the **EU Framework Programme (FP)**. The current programme, FP7, has allocated €2.3 billion (or £1.6 billion²⁴⁰) for energy innovation over 7 years from 2006.

6.23. The **Energy Technologies Institute** will launch in summer 2007. It is a joint venture partnership which brings together public and private sector R&D in the UK to set strategic direction and fund its delivery. It will provide the UK with a world-class means for delivering applied energy technology research to underpin eventual deployment. To do this, the Institute will connect the best scientists and engineers working in academic and industrial organisations both within the UK and overseas. The projects these teams deliver will accelerate the progress of industrially applicable innovative energy technologies through the innovation system to enable some commercial deployment within 10 years.

6.24 The objectives of the Institute are to:

- accelerate the deployment of new low carbon energy technologies, including the efficient production and use of energy, in support of the UK's energy and climate change goals;
- provide a strategic focus in the UK for low carbon energy R&D;
- increase the level of funding in the UK for low carbon energy R&D;
- promote international technology collaboration;
- increase UK R&D capacity; and
- promote people, skills and knowledge sharing.

6.25 Some of the world's biggest energy companies are already involved in this unique venture and helping to drive the initiative forward – BP, E.ON UK, Shell, EDF Energy, Rolls-Royce, Caterpillar, and Scottish and Southern Energy Group. The funding contribution of members of the Institute, matched by Government, provides it with a budget of a minimum of around £600 million over a lifetime of a minimum of 10 years. Additional private sector partners are being identified to match the Government's commitment of up to £550 million over the next decade.



6.26 The Institute will focus on a small number of specific R&D projects relevant to industry, both commissioning and funding its own research and supporting worthwhile projects run by third parties. This will include R&D in support of demonstration (including possible funding for small scale pre-commercial demonstrations) and eventual deployment, selected from within a framework of the following general themes:

- large scale energy supply technologies
- energy security of supply
- end use efficiency/demand management
- transport
- small scale energy supply technologies
- support infrastructures (such as energy supply networks, storage skills and capacity)
- alleviating energy poverty.

6.27 In selecting areas for investment, the Institute will be looking both for technical viability and commercial attractiveness. Consequently, part of its remit will be to consider longer-term energy market scenarios. This work will be informed by technology “roadmaps” covering all stages of the innovation system developed by DTI, the Energy Research Partnership and the UK Energy Research Centre amongst others. The Institute will play an important role in identifying and supporting the development of the technologies available to achieve our targets for 2050 and beyond. By regularly updating the market scenarios and technology roadmaps it will be able to provide strategic direction and pull for the work funded in UK universities by the Research Councils’ Energy Programme.

6.28 The R&D will be carried out in centres of excellence across the UK and overseas. In deciding the Institute’s programme of work it will pay particular attention to the technical and commercial viability of a technology, as well as existing work underway elsewhere around the world.

6.29 From July 2007 the DTI Technology Programme will be directed by a new executive body, the **Technology Strategy Board**, set up to drive forward the Government’s Technology Strategy. The Technology Strategy Board will work closely with the Energy Technologies Institute to align the direction of funding of low carbon energy technologies. Requests for proposals for low carbon energy projects will be handled under existing arrangements during 2007 to ensure a smooth transition from the existing Technology Programme.

6.30 Other organisations are also active in funding development and other parts of the innovation chain. The **Carbon Trust**, an independent company funded by Government, works with research institutions and industry to identify and help accelerate innovative low carbon technologies. They offer a variety of mechanisms of support including grants for R&D; strategic and business development advice to start-up companies; funding to overcome barriers to commercialisation; and technical expertise and venture capital investment for low carbon businesses.

BOX 6.2 THE DEVELOPMENT OF WAVE AND TIDAL-STREAM TECHNOLOGIES

Wave and tidal-stream energy technologies have the potential to make a significant contribution towards our energy and climate change objectives. There are currently a number of concepts at various stages of development with a small number of devices having already been demonstrated at full-scale.

Since 1999, the Government has through the DTI, Research Councils and the Carbon Trust programmes committed in excess of £100 million funding to support RD&D of marine technologies. This includes support for new infrastructure such as the European Marine Energy Centre in Orkney, which provides dedicated testing facilities for marine energy technologies and the proposed “Wave hub” in the South West which could host a number of wave power projects.

The launch of the £50 million Marine Renewables Deployment Fund (MRDF) and a similar scheme funded by the Scottish Executive has also stimulated the interest of major power companies in the sector. The MRDF moved to an “open call” basis in March 2007, so that the MRDF can fund proposals at any time. The UK has in place the most comprehensive set of support measures for the development of wave and tidal-stream in the world. Even so, progress towards full commercialisation of these technologies has been slower than expected. The Government is working closely with the Renewables Advisory Board and others to drive forward progress in this sector.

The UK is a founder member of the International Energy Agency’s Ocean Energy Systems (OES) Implementing Agreement. OES brings together the leading global players in marine energy to work on commercialisation issues that need to be addressed at a global level such as standards, testing and resource assessments.

Innovation system support mechanisms – Demonstration and Deployment

6.31 Demonstration stage support generally takes the form of grants to enable the capital costs and risks of full-scale demonstration of technologies to be shared between public and private sector. Sources of capital grant funding for low carbon energy technologies include the Government, Devolved Administrations and Regional Development Agencies. The EU has also announced its intention to support the demonstration of hydrogen and fuel cell technologies through a Joint Technology Initiative.

6.32 In June 2006, the Government announced the creation of a new cross-Government fund to invest in low carbon energy and energy efficiency technologies. Led by Defra, DTI and DfID the Environmental Transformation Fund brings together the Government’s work within the UK and internationally to support, amongst other things, the demonstration and deployment of new energy technologies, and to promote the better use of energy. An international section of the ETF will support development and poverty reduction through environmental protection in developing countries, including



action to tackle climate change. The Fund brings a new level of coherence to our support for the transformation to a low carbon economy.

6.33 The Fund is a means to:

- support the demonstration and deployment of low carbon energy and energy efficiency technologies for heat, electricity and transport in the UK including biofuels and other renewables, and low carbon fossil fuel technologies such as carbon capture and storage (CCS).
- pick up technologies emerging from R&D and help fund them through the later stages of the innovation system. In turn, as we have seen, the lessons from demonstration and early deployment may point to a need for further research and development. To this end the Fund will work closely with the Energy Technologies Institute, the Technology Strategy Board and others to optimise the route to market within the UK and globally; and
- finance overseas development projects to support development and poverty reduction through environmental protection, and help developing countries respond to climate change. The international section of the Fund will be dedicated to overseas development aims. Its work will include bilateral projects in developing countries as well as multilateral facilities such as the World and Regional Development Banks' Clean Energy Investment Frameworks. It will also support adaptation and provide access to clean energy, and help tackle unsustainable deforestation.

6.34 The Fund will open in April 2008. Funding of £800 million for the international element of ETF was announced in the 2007 Budget, for the three years from April 2008-2011. Details of the domestic element over the same period will be announced during 2007, in the context of the Comprehensive Spending Review.

BOX 6.3 THE DEMONSTRATION OF HYDROGEN AND FUEL CELL TECHNOLOGIES

Hydrogen and fuel cells (which can be powered from hydrogen) are linked technologies with significant carbon-saving potential where the hydrogen is produced from renewable or low carbon sources.

Fuel cells and hydrogen technologies face significant technical and economic challenges if they are to displace the incumbent technologies. A huge international effort (both public and private) is being devoted to overcoming them. This will require fundamental and applied research, development and demonstration. Non-technical barriers such as codes, standards and regulations will become increasingly significant as the technology moves towards demonstration and deployment, and efforts are already being made at the international level to address this problem.

A new UK demonstration programme has been launched and the first call for proposals opened in September 2006. The programme offers a total of £15 million funding over three years for hydrogen and fuel cells. Basic research is being supported by the Research Councils, including the directed programme SUPERGEN, which is funding separate consortia working on hydrogen and fuel cells. The European Commission is

BOX 6.3 Continued

expected to come forward with proposals later this year, for a Fuel Cell and Hydrogen Joint Technology Initiative to support further applied research and demonstration activities of these technologies. The use of hydrogen as a transport fuel is also considered in chapter 7.

6.35 There are various mechanisms to support the deployment of low carbon technologies in all sectors. These include the Renewables Obligation, the EU Emissions Trading Scheme, the Climate Change Levy and the Renewable Transport Fuels Obligation (from 2008). These mechanisms either help reduce the operating costs and therefore make technologies competitive in the market or penalise those technologies that have high emissions. The Government also intervenes to address barriers to deployment, for example through the reforms to planning procedures which are discussed in chapter 8.

6.36 Building credible long-term frameworks for tackling climate change are a key part of providing clear long-term signals to industry about the future path of emissions. Establishing a price for carbon gives industry certainty about the value of emissions reductions while trading mechanisms such as EU ETS allow cost effective sharing of the burden of reducing carbon emissions.

BOX 6.4 CHP FACILITY

A biomass Combined Heat and Power (CHP) facility at Balcas Timber, near Enniskillen in Northern Ireland, was commissioned in 2005 and has benefited from £2 million of capital grant funding from DTI.

The CHP plant makes Balcas' Enniskillen sawmill site self-sufficient in electricity, with surplus electricity sold to the Northern Ireland grid. Its heat is used in the production of biofuel pellets. The plant is one of the largest biofuel pellet production facilities in the British Isles. The plant produces enough biofuel pellets each year to meet the energy needs of 10,000 households.

The company sees the potential for replication of the project elsewhere in the UK and announced in November 2006 plans for a £24 million plant at Invergordon, with funding from Highland and Islands Enterprise. As well as being carbon neutral and a direct replacement for fossil-fuels, biofuel pellets are generally a cost-effective source of heat compared with oil.

Developing the right skills

6.37 The skills and competencies of the workforce are of growing importance to the energy sector, as they are for the economy as a whole. It is crucial that employers have the trained staff they need for the safe and efficient operation of their businesses and the reliable supply of energy to their customers. It is also crucial that workers have the skills and flexibility to handle the new technologies and business practices that will emerge in the coming decades.



6.38 The Government's Skills Strategy²⁴¹ aims to ensure that employers across all sectors can recruit people who have the right skills. The recent Leitch Review²⁴² illustrated the significant challenges that face the UK. It recommended that the UK should commit to becoming a world leader in skills by 2020, benchmarked against the upper quartile of OECD. Government has an important role to play in providing the right framework and to work with employer organisations and trade unions to ensure that education and training is delivering the right skills. However, it is for employers to ensure that the workforce is equipped with the work-specific skills they need.

Skills challenges in the energy sector

6.39 Although the energy sector employs a broad range of people with a wide variety of skills, there are some challenges that are common to the workforce as a whole. There is evidence of skills gaps across the energy sector. For example, work undertaken for Cogent's²⁴³ Sector Skills Agreement showed 72% of companies experiencing skills gaps, notably in project management, technical and practical skills. Skills gaps are also increasing because the workforce is faced with unfamiliar processes and technologies. Skills shortages, on the other hand, are likely to increase because the workforce is older than the population as a whole and many will retire in the coming decade. Workforce retirement will coincide with higher demand for people to deliver the increased investment needed to replace old power stations and infrastructure. Where they occur, skills shortages will affect all levels from apprentices to graduates and above²⁴⁴.

6.40 Recruitment and training are key to developing a new workforce but there is the additional challenge of transferring knowledge and experience from the older generation. This is important because, even though new technologies are being introduced, a significant proportion of today's power stations, gas terminals, refineries, transmission and distribution systems will be in operation beyond 2025, albeit with more advanced and cleaner equipment. We shall also of course see significant new investment in power stations and in transmission and distribution networks.

6.41 Workforce mobility and retention place additional pressures on the energy sector. Skills shortages tend to produce a churn of workers as they move around the industry. Internationally, while the UK remains attractive to workers from overseas, there are also rewarding opportunities for our own workers in other countries. The UK must continue to be an attractive investment option for the international companies currently operating here, who have a key role in skills development and to new companies seeking to invest.

Impact of the skills situation

6.42 Analysis by the Sector Skills Councils²⁴⁵ indicates that, over the next five years, skills gaps and shortages in the UK should not represent a critical threat to security of energy supplies. However, some labour market tightness

241 Skills: *Getting on in business, getting on at work*. White Paper, March 2005 and 14-19 Education and Skills White Paper February 2005.

242 Leitch Review of Skills. *Prosperity for all in the Global Economy – World Class Skills*. December 2006.

243 Cogent is the Sector Skills Council for the oil and gas, nuclear and chemical process sectors.

244 *Investigation into high-level skills shortages in the energy sector*. Energy Research Partnership, March 2007 (<http://www.energyresearchpartnership.org/files/ERP-Skills-Brochure.pdf>)

245 Sector Skills Agreements published by Cogent and Energy & Utility Skills

is likely and there could be upward pressure on wages and prices that will persist until supply/demand imbalances are resolved. These pressures will signal the need for increased recruitment and training but the delivery of skills takes time. Forward planning will require greater attention than it has in the recent past.

6.43 In cases where skills shortages become acute, training might not be able to fill immediate vacancies in time. Also, as older workers retire, know-how and experience will be lost. Immigration may have to play a part in maintaining the skills base in the short term and the Government will therefore ensure that work permit policy can respond to requests for recruitment from overseas when labour market tightness indicates that it is necessary. However, this will not provide a long-term solution to the problem; the international demand for skills is increasing and the UK will not be able to rely solely on immigration to supply large numbers of workers. Nor would we want to be reliant on overseas workers in place of developing our own people. Therefore, overseas recruitment will be only part of the solution to bolster experience levels whilst the skills of the UK workforce are further developed.

BOX 6.5 DIVERSITY

As might be expected from the age profile, the energy workforce is less diverse than the wider population. Overall, only around 25% of the energy workforce is female, compared to 43% nationally, and only around 4% are from a black/ethnic minority background versus 8% for the whole economy. Employers are now recruiting from a wider range of backgrounds and the proportion of women and ethnic minorities is increasing, although progress is not uniform. In companies that have made good progress, for example those specialising in engineering design and project management, diversity is working through to team leader and senior professional jobs.

The DTI provides funding to the UK Resource Centre for Women in Science, Engineering and Technology (SET) which works with a wide range of energy companies to encourage the recruitment, retention and progression of women in SET. This has included the provision of support and advice on planning, sharing best practice, building a network between companies and recognising success.

What is being done to address skills issues?

6.44 Much has already been done to tackle the skills challenge across the energy sector, both to improve the broad policy framework around education and training and to step-up recruitment and training. Current skills in the energy sector are built on a legacy of apprentice and graduate training by the previously nationalised industries, the oil industry and major manufacturers. While Government takes the lead in education, employers take the lead in work-specific skills development and they are best placed to continue to do this. For its part, Government will work with employers, Sector Skills Councils (detailed in driving the skills agenda paragraphs in this chapter), the trade unions and other interested parties to help achieve a well-skilled workforce for the future.



Setting the right framework

6.45 Many companies, especially in the supply chain, have been faced with short term business horizons, making it hard for them to justify taking on apprentices or graduate trainees for whom they feel there may be no clear future. The Government's aim is to set the right overall market and investment framework to enable companies to make investments in infrastructure and people over the longer-term. This objective, which is also supported by the regulator, will make it easier for companies to invest in people.

Investing in education

6.46 As well as continuing to invest in and improve the teaching of science, engineering and technology for all schools, the Government will work to increase the numbers of female students and those from ethnic minorities taking these subjects, support initiatives to increase apprenticeships, and encourage more students to study science and technology subjects at university. The Government will ensure that education and training policy, including the initiatives that result from the Leitch Review, are informed and guided by energy sector issues.

Driving the skills agenda

6.47 In the early years of this decade, Government replaced the industrial training organisations with 25 Sector Skills Councils. The Sector Skills Councils are employer-led and each includes at least 500 000 workers. They are charged with developing a strategic approach to skills, which is defined in a Sector Skills Agreement. This includes detailed skills and demographic analysis, which is being used to develop plans to ensure that the needs of the energy sector are met, both now and in the future. In addition, Sector Skills Councils have a key role in defining skills and competencies, setting standards and ensuring that training provision is of a high quality. They also network with employers in their sector to support specific activities, some examples of which are given in Box 6.6. In view of employers' key role in skills development, it is vital that they and their representatives are fully engaged in the Sector Skills Councils, especially those concerned with the energy sector.

6.48 The energy sector has two Sector Skills Councils, Cogent (for oil and gas, nuclear, refining and the chemical industries) and Energy & Utility Skills (for power generation, gas and electricity transmission and distribution), plus a training board (The Engineering Construction Industry Training Board) that covers the design and construction of capital plant.

6.49 Trade unions are represented on the Boards of the Sector Skills Councils – Unison on the Energy and Utility Skills Board; Transport and General Workers' Union, Prospect and Amicus on the Cogent Board. This gives trade unions a key role to play in helping to direct, with employers, the strategic skills agenda, as well as the valuable role they play in encouraging skills development at local level.

BOX 6.6 EMPLOYER ACTION ON SKILLS

The Power Academy is an initiative by 15 key employers in the power sector, six universities and the Institution of Engineering and Technology that is sponsoring up to 60 undergraduates each year to study power engineering at university.

Ambition Energy, a scheme led by Energy & Utility Skills that trained 2500 long-term unemployed to become Corgi-registered gas installers in the period 2002-2006, has provided a model example of how to address skills shortages by non-traditional routes of entry. Elements of both the Power Academy and Ambition Energy can be seen in power sector schemes being introduced in the USA to mitigate the impending retirement of the baby boom generation.

The engineering construction workforce (responsible for building power stations, refineries etc) faces a net loss to retirement at a time of increasing demand for its services. The Engineering Construction Industry Training Board, with the sector's employers, is planning a step change in recruitment and training that will deliver a highly-skilled workforce for the future.

6.50 Several Sector Skills Councils are making use of additional Government support to develop National Skills Academies for their sector. These will provide a central focus for workforce development and will ensure that all employers have access to the best quality training. Some details are given in Box 6.7.

BOX 6.7 SKILLS ACADEMIES

Applications led by Cogent for the National Skills Academy for Nuclear and separately for the Process Industries were given approval to progress to the development stage at the end of October 2006. The employer-led Academies will seek to deliver a coherent skills strategy that will address the specific needs of the nuclear industry (around 20% of the UK's electricity currently comes from nuclear power), and chemical process sectors. The Academy for nuclear intends, in its early years, to deliver 800 apprenticeships and around 150 Foundation Degrees for new entrants to the industry, while re-training or up-skilling 4000 existing employees each year to NVQ levels 2 - 4.

Energy & Utility Skills has begun a review, with its industry stakeholders, of the long-term skills needs and the potential benefits of National Skills Academies for the power and gas sectors. The Engineering Construction Industry Training Board submitted a proposal for a national Skills Academy earlier this year.



6.51 In England, regional economic strategies, prepared by the Regional Development Agencies (RDAs) on behalf of the nine English regions, capture the strategic skills priorities that will drive sustainable economic development and regeneration. Each RDA comes together with the Learning and Skills Council, employers, Sector Skills Councils and other partners in Regional Skills Partnerships to drive forward the skills agenda in each region. Skills and training is a devolved matter in Scotland, Wales and Northern Ireland and the Devolved Administrations set their own strategies for tackling skills priorities. Government will continue to work with RDAs and the Devolved Administrations to develop the energy skills agenda, to ensure that:

- energy skills issues are better understood at regional and local level; and
- The existing structures for co-operative working between sectors and regions on skills issues are made much more effective.

Supportive regulation and working with Ofgem

6.52 Skills development is recognised as a legitimate and very necessary area of expenditure for companies operating within the regulatory framework. The Regulator encourages investment in this area by clearly stating what companies need to deliver to their customers and putting incentives in place that reward those that innovate and enhance their efficiency and performance. A consistent approach by the Regulator and clear strategy from industry initiatives, such as the Power Academy, are also ways of encouraging companies to put longer-term plans in place.

6.53 Ofgem's Innovation Funding Incentive for electricity distribution companies aims to re-invigorate R&D within the sector by bringing industry and universities closer together, helping supply chain companies to bring in new technology and developing technical skills for the future. The scheme has recently been extended to include electricity and gas transmission companies. This increase in research and development across the sector will, in turn, further encourage the development of intermediate and high-level skills.

Skills for the future

6.54 All agree that the skills outlook is challenging and that we must ensure, not only a transfer of skills, but of know-how and experience, to a new generation of workers. In addition, we must develop new skills sets and competencies to deliver and operate the low carbon economy, and maintain the skills we need to deliver secure energy supplies.

6.55 We shall continue to work with the energy industry, the Sector Skills Councils, and other interested parties to ensure that the job market is able to provide the skills to match the deployment of new technologies. We are asking the Sector Skills Councils to report on the skills gaps in the energy sector and action being taken to address them.

6.56 The UK is fortunate to have excellent schools, colleges and training organisations that can rise to the challenge, together with strategic direction through the Sector Skills Councils to identify and manage what needs to be done. Meeting the challenge will not only ensure that the energy industry of the future has the skilled people it needs, but will also create a world-class education and training capability that can bring overseas business to the UK. Working together with the Sector Skills Councils and the National Skills Academies, Government, employers and trade unions need to highlight the

career opportunities in the energy sector for young people now at school or in higher and further education, so that the sector can better attract the engineers and other skilled people it needs.

RESEARCH AND DEVELOPMENT, DEMONSTRATION AND DEPLOYMENT, AND SKILLS SUMMARY OF MEASURES

We will facilitate the demonstration and deployment of sustainable and low carbon technologies by:

- **working with industry and key partners within the UK and globally, to speed the route to market for emerging low carbon energy technologies through a comprehensive programme of public sector support;**
- **increasing UK R&D funding through the new public/private sector Energy Technologies Institute;**
- **delivering the Environmental Transformation Fund in 2008 to support demonstration and deployment and energy efficiency;**
- **continuing to work with the energy industry, the Sector Skills Councils and other interested parties to ensure that the job market is able to provide the skills to match the deployment of new technologies; and asking the SSCs to report on the skills gaps in the energy sector and action being taken to address them.**



Transport

Introduction

As the economy grows and becomes more globalised, with more goods and services moving ever greater distances, the importance of transport increases. The recent Eddington Study showed that a good transport network is key in sustaining economic success, linking people to jobs, delivering products to markets and supporting domestic and international trade.

7.1 Transport accounts for around a quarter of UK domestic energy use and emissions of carbon. The majority of the UK's transport greenhouse gas emissions are carbon dioxide and road vehicles are responsible for 93% of this. In addition to the climate impacts of transport, the heavy dependence of the sector on oil at a time when the UK will increasingly rely on imported oil, carries potential consequences for the security of our energy supply.

7.2 The latest DTI projections suggest that, without the further measures included in this White Paper, domestic transport emissions may well continue to rise gradually to 2020²⁴⁶. Longer-term projections suggest there is then some potential for emissions to fall, associated with continued improvements in energy efficiency and greater penetration of more fuel efficient and lower carbon vehicles²⁴⁷.

7.3 There are a range of measures we can now take to address transport's carbon emissions in both the short and longer-term. For transport to reduce its climate change impacts we need to enable smarter, more energy efficient use of transport and we need to reduce carbon emissions by bringing about changes in the types of vehicles and fuels we use. In addition to this, these policies to reduce transport's reliance on oil, diversify transport technology and improve fuel efficiency will also deliver improved security of energy supply.

²⁴⁶ This includes road, rail and freight journeys as well as the aviation and shipping journeys that start and end in the UK. The projections include only firm and funded measures. See DTI: *Updated Energy and Carbon Emissions Projections*, May 2007, <http://www.dti.gov.uk/energy/whitepaper>

²⁴⁷ DTI: *The MARKAL Model in the 2007 Energy White Paper*, <http://www.dti.gov.uk/energy/whitepaper>, and PSI: *Final Report on DTI-DEFRA Scenarios and Sensitivities using the UK MARKAL and MARKAL-Macro Energy System Models*, <http://www.ukerc.ac.uk/content/view/142/112>

7.4 This chapter:

- sets out the potential for emissions reductions in transport for both the near and long-term;
- describes measures to be taken within the UK, the EU and internationally to bring about emissions reductions from transport;
- explains the importance of new low carbon transport technologies and measures to support these; and
- sets out policies which will enable individuals to make smarter, lower carbon, travel choices.

7.5 The biggest potential reductions in emissions from transport will be realised as new technology comes through in the medium to long-term. However, it is important we act now. We want to achieve carbon savings from measures that are cost-effective in the short-term, and to establish the frameworks, market signals and information to secure a more fundamental shift towards environmentally friendly transport in the future.

7.6 We must not forget that the challenge is global. Transport services, vehicles and the fuels that power them are internationally traded goods. It is essential we show leadership through our domestic policies so we can have credibility and influence at an international level.

7.7. The inclusion of international aviation and shipping in the UK inventory would alter our emissions projections. As an illustrative example we expect emissions from UK aviation to grow from 10.2 MtC in 2005²⁴⁸ to between 15.7MtC and 29.1MtC by 2050²⁴⁹, assuming that all domestic and only departing international flights are allocated to the UK. Although emissions from international aviation and shipping are currently not counted against our domestic targets, we are working towards agreement in the UN on how to allocate these emissions to individual nations. Our projections underline the importance of international action to address emissions from these sectors.

Potential for emissions reductions in the Transport Sector

7.8 The Stern Review²⁵⁰ emphasised the importance of urgent and cost-effective action on climate change across all sectors of the global economy, but also noted that:

“Transport is one of the more expensive sectors to cut emissions from because the low carbon technologies tend to be expensive and the welfare costs of reducing demand for travel are high. Transport is also expected to be one of the fastest growing sectors in the future. For these two reasons, studies tend to find that transport will be among the last sectors to bring its emissions down below current levels.”

7.9 As Stern has shown, the potential for significant short-term cost-effective abatement in the transport sector is limited but in the long-term

248 Defra: 2006, <http://www.defra.gov.uk/environment/statistics/index.htm>

249 DfT: *Aviation and Global Warming*, 2006, www.dft.gov.uk/about/strategy/whitepapers/air/docs/aviationandglobalwarmingreport

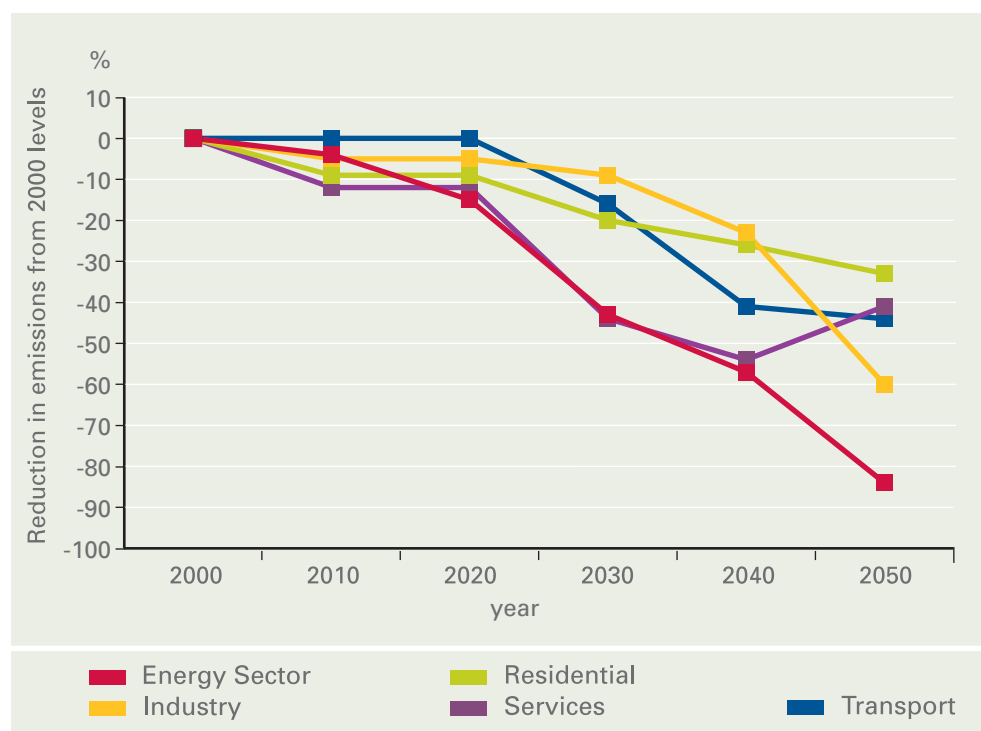
250 See chapter 1 for further details.



it is much higher. Analysis has suggested that, with appropriate measures, reductions of 40-60% from domestic transport are possible by 2050, but as figure 7.1 illustrates these would happen later than in other sectors.

7.10 This does not mean that short-term action to address emissions from transport is not necessary or will have no effect. Indeed existing transport policies, as set out in *Climate Change The UK Programme 2006*, will mean that emissions from transport will be 15% lower in 2010 than if we had not put the programme in place. But it does underline the importance of taking early opportunities to cut emissions while also laying the longer-term foundations for low carbon transport technologies.

FIGURE 7.1. UK MARKAL MACRO CARBON EMISSIONS REDUCTION BY SECTOR – SCENARIO SHOWING LEAST COST ROUTE TO 60% REDUCTION BY 2050.



Source: MARKAL-Macro model. Central scenario, 2030+ trajectory.

Note: Energy Sector includes electricity generation and upstream oil and gas production.

7.11 As set out in the Energy Review Report, the Government is working to tackle emissions from transport by: reducing the carbon content of fuel; reducing the carbon emissions of vehicles; encouraging moves towards more environmentally friendly transport and, where appropriate, using emissions trading.

7.12 Our package of measures seeks to balance the demand for transport and the need for mobility against ensuring that the costs of climate change are met. A variety of mechanisms such as emissions trading²⁵¹ can ensure that an overall environmental objective is achieved cost-effectively to sustain productivity and economic growth, and that transport contributes to our international policy goals.

²⁵¹ See chapter 1 for details on international emissions trading schemes and flexible mechanisms such as the Clean Development Mechanism (CDM).

7.13 Since its publication, the Stern Review has moved the international debate on tackling climate change further forward, and its policy framework is a useful way of presenting and understanding the Government's policies on transport emissions:

- **Carbon Pricing** – through tax, trading or regulation e.g. fuel duty, aviation in EU ETS, the Renewable Transport Fuel Obligation;
- **Technology Policy** e.g. the Low Carbon Transport Innovation Strategy (LCTIS), Voluntary Agreements with manufacturers on new car carbon emissions (VAs);
- **Behavioural Change** e.g. through investment in public transport, fiscal incentives, further development of smarter travel choices, supported by information and communication campaigns, and social research.

Transport policies to tackle climate change

Carbon Pricing – through Tax, Trading or Regulation

7.14 The first part of the Stern Review's policy framework is the principle of carbon pricing, whereby the polluter should meet the full external costs of the emissions they produce. The Eddington Study recommended factoring the carbon costs into prices, which in turn provides an incentive to either be more energy efficient or to invest in low carbon alternatives. The Government will look to use carbon pricing mechanisms across all modes of transport in line with the findings of the Eddington and Stern Reviews, through a variety of means: taxation, trading and regulation. This section sets out the Government's policies in this area.

Including Aviation in the EU Emissions Trading Scheme (EU ETS)

7.15 The Government believes that the best way for aviation to contribute to the goal of emissions reduction is through a well-designed emissions trading scheme. This will ensure that the emissions reductions take place in as cost-effective a manner as possible, enabling emissions reductions to take place within the sector or through the aviation sector paying for reductions in other sectors.

7.16 The Energy Review Report set out the substantial progress that had been made during the UK's Presidency of the EU to include the sector in the EU ETS. Since then the European Commission has published legislative proposals to include aviation in the EU ETS (see Box 7.1 for details). The UK welcomed this and will continue to support the debate in Europe on aviation's incorporation into the EU ETS. Our aim is to ensure its inclusion in a robust and environmentally efficient way, as soon as possible.

7.17 We have now begun working with other Member States on the details of the legislation. To help inform our negotiating position, the Government launched a public consultation on 30 March 2007 and we will continue to consult with industry and international partners as the negotiations progress. Once the legislation has been adopted, we will use our influence to ensure it is implemented appropriately and that the necessary monitoring and reporting structures are in place.

7.18 As part of our ongoing consultation we will consider the potential impact for UK carbon emissions. However, for illustrative purposes, our indicative analysis suggests that, considering the contribution of domestic flights only



and depending on the cap on emissions, the UK could reduce its UK domestic carbon emissions by 0.2-0.4MtC per year by 2020²⁵².

BOX 7.1 EUROPEAN COMMISSION LEGISLATIVE PROPOSAL TO INCLUDE AVIATION IN THE EU ETS

In December 2006, the European Commission published a draft legislative proposal on the inclusion of aviation in the existing EU ETS, to include internal EU flights from 2011 and all flights entering or leaving the EU from 2012. The Government supports a proposal that covers at least all flights departing EU airports, not just intra-EU flights.

The draft legislation proposes to allocate allowances through a combination of benchmarking and auctioning, with the overall number of allowances determined at Community level by reference to average emissions from aviation in the years 2004-2006. The proposal does not directly address the non-carbon emissions from aviation, but the Commission has committed to put forward a proposal to tackle the effects of oxides of nitrogen by the end of 2008.

The Commission's impact assessment for the proposal, based on stabilisation of aviation emissions at 2005 levels, suggests annual EU-wide carbon savings of 12-50 MtC a year by 2020, compared to business as usual emissions levels, depending upon the scope of the scheme. Given some access to project credits (e.g. CDM) the impact of including aviation in the EU ETS on allowance prices is likely to be limited.

Working through the UN

7.19 The Government recognises that for an international industry such as aviation, a global solution is ultimately required. Thus the UK continues to play a leading role in the International Civil Aviation Organisation (ICAO) to find ways of minimising the adverse impacts of aircraft emissions.

7.20 We support the development of an international trading regime through the ICAO and are contributing to work on developing guidance for states who wish to include aviation in emissions trading schemes. In terms of the use of other economic instruments, the UK recognises that provisions such as those exempting aviation fuel from tax are anomalous, and we have been working through ICAO to reach agreement on this matter. The UK is also pressing for the modernisation of the Chicago Convention²⁵³, particularly in relation to security and the environment. The ICAO Assembly in 2007 will be the starting point for work to help equip international aviation with a structure and legal framework that builds on ICAO's good work, whilst taking forward an agenda more reflective of today's world.

252 This is an illustrative estimate of the carbon emissions gap accounted for by UK domestic aviation in 2020 assuming a cap set at 2005 emissions in line with the current Commission proposal. This is based on published DfT carbon emissions forecasts for 2020 under different scenarios and Defra 2005 actual data.

253 The 1944 Chicago Convention established the International Civil Aviation Organisation (ICAO) and is the international treaty that governs civil aviation.

7.21 The UK's policy on aviation was set out in the 2003 Aviation White Paper and subsequent progress report (see Box 7.2).

BOX 7.2 AVIATION

The Future of Air Transport White Paper set out a long-term strategy for the sustainable development of air travel to 2030, recognising growing aspirations to travel as well as the needs of our economy and the need to protect our environment.

A report on the progress of policy commitments was published on 14 December 2006. The progress report confirmed the Government's commitment to ensure that aviation meets the full cost of its climate change emissions. This included the introduction of a new emissions cost assessment to inform decisions on major increases in airport capacity and consider whether the aviation sector is meeting its external climate change costs. The Government will consult on the development of this emissions cost assessment over summer 2007.

Surface Transport in the EU Emissions Trading Scheme (ETS)

7.22 The Energy Review Report committed the Government to engaging with key organisations, the European Commission and other EU member states to ensure that the potential for inclusion of emissions from surface transport in the EU ETS is given serious consideration. The EU ETS is currently being reviewed by the Commission, and the Government has been working to encourage the Commission and other Member States to consider the inclusion of surface transport.

7.23 The inclusion of road transport in the EU ETS could be a cost-effective means of delivering significant carbon savings. This could be done in different ways, but one approach would be to require fuel producers to hold carbon allowances to cover the total amount of carbon emissions resulting from the fuel they sell. The benefits in terms of carbon savings would be highly dependent on a number of assumptions, not least the number of allowances allocated to the road transport sector. The tighter the cap on allowances allocated to the transport sector, the greater the carbon savings but also the higher the costs.

7.24 We will be carrying out detailed analysis of this approach, including further consideration of the potential impacts on UK competitiveness and the price of carbon allowances. The carbon savings arising from the inclusion of road transport would depend on the number of allowances allocated to the transport sector. For instance, analysis we have conducted for this White Paper suggests that if the cap was calculated on the basis of a 2-5% under-allocation to the transport sector, this could save in the region of 1-2MtC in 2020.



7.25 Taking this work forward we reaffirm the policy we set out in *Climate Change: The UK Programme 2006* and the 2006 *Energy Review Report* that an EU-wide approach is preferred to address emissions from surface transport.

Fiscal Measures

7.26 When deciding which policy is most appropriate in addressing environmental challenges, the Government must use the most effective instrument, for example, regulation, voluntary agreements or fiscal measures. The Government set out details of how environmental policy should be developed in HM Treasury's 2002 publication, *Tax and the environment*.

7.27 The Government has already demonstrated its willingness to use fiscal measures to contribute to achieving its environmental goals in transport:

- fuel duty is a tax on vehicle use, sending a clear environmental signal to motorists that driving less fuel efficient vehicles will be more expensive;
- in 2002, Company Car Tax was reformed to make it carbon-based; and
- Vehicle Excise Duty (VED) was reformed so that from March 2001 it became graduated by carbon emissions. Budget 2006 reduced vehicle excise duty for the lowest emission cars to zero. The UK's VED structure has been recognised by others as a template to follow with recent announcements by both the German and Portuguese governments on their intention to re-structure their equivalent VED taxes to reflect the carbon emissions of vehicles.

7.28 Coupled with these initiatives to encourage the use of more fuel efficient vehicles, there are also duty incentives for motorists to use alternative fuels such as road fuel gases, and biofuels.

7.29 Budget 2007 announced further measures in support of the Government's objective to address the environmental impacts of transport. The announcements included:

- raising fuel duty by 2 pence per litre from October 2007, to be followed by a 2 pence per litre increase in 2008, and a 1.84 pence per litre increase in 2009;
- increasing vehicle excise duty for the most polluting cars (graduated VED band G) to £300 this year, rising to £400 next;
- cutting vehicle excise duty for graduated VED band B cars to £35 per year; and
- extending the 20 pence per litre duty differential for biofuels to 2009-10, which, alongside the Renewable Transport Fuel Obligation, will mean a 35 pence per litre incentive in that year.

7.30 Based on the principles of policy already established, we will continue to examine how fiscal and other policy instruments can achieve our aims.

Biofuels and the Renewable Transport Fuel Obligation (RTFO)

7.31 The use of biomass to produce biofuels for road transport has significant scope to deliver carbon savings as well as other environmental, social and economic benefits. For this reason, the Government announced in November 2005 that it would introduce a Renewable Transport Fuel Obligation (RTFO) to require transport fuel suppliers to ensure 5% of total fuel sales are from renewable sources by 2010/11. This represents around 2.5 billion litres of fuel per annum and is expected to come almost entirely from biofuels. We estimate that at this level, the RTFO will save an estimated 1 million tonnes of carbon each year, the equivalent of removing around 1 million cars from our roads²⁵⁴.

7.32 As confirmed by Budget 2007, the RTFO will be the UK's primary mechanism to develop a healthy market for transport biofuels, as well as delivering the objectives of the EU Biofuels Directive²⁵⁵. Alongside the RTFO the Government offers a 20 pence per litre duty incentive on biofuels, which will be maintained until at least 2009-2010.

7.33 The Government made clear in the Energy Review Report that it intends to increase the level of the RTFO beyond 5% after 2010/11, provided certain conditions are met:

- confidence that the biofuels will be produced in a sustainable way, so that they deliver the maximum practicable carbon savings with the minimum practicable adverse environmental impact;
- certainty that the use of blends of biofuel higher than 5% will not lead to mechanical problems, particularly for owners of older cars which were not designed to run on such mixtures²⁵⁶; and
- confidence that the costs to consumers will be acceptable, both in terms of fuel prices at the pump, and in terms of wider economic impacts, including for example the impacts on food prices and other industries which make use of similar feedstocks.

7.34 The Government published a further consultation on the details of the RTFO on 22 February 2007²⁵⁷. This consultation seeks views on both the detailed implementation of the 5% obligation in 2010, as well as issues relating to the future evolution of the RTFO including appropriate levels of future targets.

7.35 Before increasing the level of the RTFO beyond 5%, the Government will want to be satisfied that this would represent an effective use of our biomass resources. We estimate that, should the Obligation be raised to 10% by 2015 subject to the conditions above being met, then the UK could save

254 This estimate takes into account emissions from the production and processing of biofuels that are produced overseas but used in the UK. However, these emissions will also be counted in other countries' emissions inventories. Consequently the reduction to be made against the UK's national inventory as reported to the UNFCCC is 1.6MtC.

255 More information on the EU Directive can be found at: http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/L_123/L_12320030517en00420046.pdf

256 The European Committee for Standardisation is the group responsible for technical specifications of fuels to be used in cars and lorries across Europe. They are currently looking into the technical difficulties of introducing biofuel blends above the current 5% limit to the existing and ageing vehicle fleet.

257 Details of the consultation can be found at www.dft.gov.uk/consultations/open/drafttrtfo/



up to a further million tonnes of carbon a year by 2020²⁵⁸. However, alternative uses of biomass include substitution for fossil-fuels in the generation of electricity and heat, as well as applications in the oleo-chemical industry²⁵⁹. These can often deliver greater carbon savings at lower cost than using biomass to produce high quality transport fuel.

7.36 The role of transport biofuels is considered further in the Government's Biomass Strategy²⁶⁰, which is published alongside this White Paper. In addition, the Government is also exploring ways to broaden the use of biofuels, and has facilitated pilots to explore other uses such as in trains.

7.37 Biofuels also form a part of the EU's climate change and energy policy. In March 2007, the European Council agreed, amongst other things, a binding target of a 20% share of renewable energies in overall EU consumption by 2020. This applies to electricity and heat as well as biofuels. The agreement also commits the EU to a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action. The Commission has been asked to bring forward detailed proposals for each Member State's contribution to the overall EU targets. After a decision has been reached, and each Member State has agreed its contribution, we will bring forward appropriate policies to deliver the UK's share.

7.38 The European Council agreement recognised the need to satisfy the conditions referred to in paragraph 750. The agreement includes the cost-effective introduction of a 10% by energy content biofuels target by 2020, subject to production being sustainable, second-generation biofuels becoming commercially available and the Fuel Quality Directive being amended accordingly to allow for adequate levels of blending. The UK will continue to work closely with European partners in developing these initiatives further. In particular, we shall need to respond to the Commission's proposals for revising the Biofuels Directive and for implementing the EU biofuel targets.

Technology Policy, Research and Development

7.39 The Stern Review notes that a carbon price alone might not be enough to overcome the market failures in research and development (R&D) and that therefore technology policy will have a role to ensure there is sufficient low carbon innovation, including in the transport sector.

258 Illustrative analysis that does not prejudice later UK decisions on the appropriate level. Estimate represents a 10% Obligation by 2015 under central oil price assumptions, and is additional to carbon savings from a 5% Obligation by 2010. This estimate takes into account emissions from the production and processing of biofuels.

259 Oleo-chemicals are chemicals derived from biological oils or fats.

260 The Biomass Strategy will be published alongside the White Paper and can be found at <http://www.defra.gov.uk/environment/climatechange/index.htm>

Successor to EU Voluntary Agreements on new car fuel efficiency

7.40 The Government recognises the need to provide clear market signals that incentivise industry to innovate and develop more environmentally friendly transport technology. Given the international nature of the automotive industry, our focus is to drive change through the EU. To this end we will continue to work with the European Commission and other interested parties on developing successor arrangements to the current Voluntary Agreements on new car fuel efficiency, which expire in 2008/9.

7.41 In September 2006 the Department for Transport (DfT) published a discussion paper on policy options to replace the Voluntary Agreements²⁶¹. Whilst the responses broadly recognised the progress made so far under the Voluntary Agreements, concern was raised about the slowing rate of progress and the likelihood of the targets not being met. There was therefore considerable support for moving to a mandatory system to replace the Voluntary Agreements. It also pointed to further issues that needed resolving before a final decision could be agreed, for example potential costs, possible benefits of trading and the way fuel efficiency targets are structured.

7.42 On 7 February 2007, the Commission published a Communication on the review of the Community strategy to reduce carbon emissions from passenger cars and light commercial vehicles. The Communication confirmed that the Commission intends to bring forward a legislative proposal to reach an average new car fuel efficiency target of 130 grammes of carbon dioxide per kilometre (gCO₂/km) by 2012, representing an improvement of around 30% over 1995 levels. Further carbon savings are to be delivered by a range of other measures, such as the use of gear shift indicators and tyre pressure monitoring systems, leading to an overall target of 120gCO₂/km by 2012. The Government welcomes the Commission's intention to bring forward a legislative framework and supports a move to demanding mandatory fuel efficiency targets. Subject to understanding how the targets will be implemented and subsequent impact assessment, the Government is supportive of the Commission's proposals. However, it is our view that the proposals should also set out a longer-term strategy for improving vehicle fuel efficiency. The Government announced in Budget 2007 that its longer-term objective is that average new car emissions be reduced to 100gCO₂/km.

7.43 There is a lot of further work to be done before any final decisions are taken, including on the appropriate level of the fuel efficiency target and how that target should be implemented. Final decisions will be subject to full and open consultation with interested parties.

7.44 The Government believes it is essential that the legislative framework enshrines certain key principles:

- **Clarity and accountability** so all parties are clear what is required to ensure effective delivery and monitoring;

²⁶¹ The summary of the responses can be found on the DfT website at: <http://www.dft.gov.uk/consultations/closed/reducingnewcarco2emissions/>



- **Cost effectiveness** of different regulatory approaches on fuel efficiency will have different costs and benefits. Greater flexibility will often ensure greater cost-effectiveness;
- **Environmental effectiveness** to ensure achievement of the stated environmental objectives;
- **Comprehensive scope** by applying the framework to all new vehicles sold in the EU regardless of place of manufacture, and also seeking to ensure further progress in fuel efficiency across all market segments; and
- **Proportionality** via thorough impact assessment, with particular attention given to setting appropriate targets and timescales.

7.45 We will continue to work with the Commission, other Member States and all interested parties with the objective of securing a Europe-wide regulatory regime that is compatible with these principles. We are optimistic that a satisfactory framework will be delivered. Our analysis suggests that in the UK we could save 1.8-4.1MtC per year by 2020, depending on the extent of fuel efficiency improvements we achieve²⁶².

7.46 This has the potential to be one of the Government's biggest interventions to tackle transport emissions. We will therefore push for an ambitious and realistic long-term target that recognises the importance of tackling climate change and of giving industry a clear signal to develop and implement new technologies.

7.47 To achieve the kind of fuel efficiency improvement outlined above will require considerable innovation. The private sector will need to sustain and enhance its investment in vehicle technologies to improve their environmental performance, the Government needs to provide the frameworks that support and stimulate this investment, as well as encouraging a successful entry to market of low carbon technologies.

Low Carbon Transport Innovation Strategy

7.48 The Government announced in the Energy Review Report last year that it would develop a Low Carbon Transport Innovation Strategy (LCTIS). Development of the strategy reflects the important role that new technology will play in delivering carbon reductions in the transport sector over the long-term. The strategy, published alongside this White Paper²⁶³, assesses where Government intervention is most usefully focussed and sets out a wide range of actions Government is taking to encourage innovation and technology development in lower carbon transport technologies.

7.49 Industry already spends a great deal on research and development (R&D). For example the big automotive manufacturers spend several billion dollars per year. However only a small proportion of this goes on riskier, less developed low carbon R&D. A key role for Government is therefore to stimulate investment in a broader range of R&D activities, including nearer and further from market options. Essential to this will be the use of regulatory

²⁶² Illustrative estimate reflecting annual improvements in new car fuel efficiency of 1.5%–3.6% p.a. Actual efficiency improvements will depend on the level of target set at EU level and application in the UK.

²⁶³ DfT: *Low Carbon Transport Innovation Strategy*, <http://www.dft.gov.uk/pgr/scienceresearch/technology/>

frameworks such as carbon pricing and fuel efficiency standards, but also Government funding aimed at accelerating the development and market penetration of new lower carbon technologies.

7.50 Accordingly:

- DfT will contribute an additional £5 million per annum to the low carbon transport theme of the Energy Technologies Institute²⁶⁴ – ensuring transport is at the heart of the Government's strategy to accelerate the development of secure, reliable and cost-effective low carbon energy technologies;
- in conjunction with the Technology Strategy Board (TSB), DfT and EPSRC will help finance and develop a new Low Carbon Vehicle Innovation Platform²⁶⁵ providing critical coordination and up to £30 million of support from 2008/09 for UK technology research aimed at accelerating the development of relevant technology. Assuming the Innovation Platform develops successfully we would envisage extending the programme to run over a number of years;
- with initial funding of £20 million, DfT will develop a new programme of public sector procurement to promote and support low carbon vehicle development, including small fleet demonstrations to provide early markets for new innovative lower carbon vehicle technologies; and,
- to ensure that Government leads by example we have set a fleet average car procurement target of 130gCO₂/km by 2010/11 for new cars purchased by Government and used for administrative operations. We will keep the target under review and look to extend the scope of this target following further analysis.

Low carbon innovation in the road sector

7.51 The road sector is the largest source of carbon emissions from transport in the UK. In developing the LCTIS the Government asked consultants E4tech to examine how the innovation system was functioning for some of the key technologies²⁶⁶.

7.52 E4tech's work highlights a range of technologies that have, in combination, the potential to make a significant contribution to carbon reduction. These technologies include more advanced versions of hybrids, including "plug-in" hybrids, fully electric vehicles, second generation biofuels, and hydrogen fuelled vehicles, whether powered by an internal combustion engine or a fuel cell. The steps outlined above will help more of these options become commercially and technologically viable. However, the success of hydrogen or electricity based technologies in delivering low carbon transport will rely heavily on the UK's future electricity generation mix, discussed in Chapter 5.

264 See chapter 6 for more information on the Energy Technologies Institute (ETI).

265 Innovation Platforms are schemes designed to bring Government and funders together with the business and research community in order to address a major market driven and societal challenge. Existing Innovation Platforms include work on intelligent transport systems and services, in the context of road congestion. More information can be found at:
http://www.dti.gov.uk/innovation/technologystategy/innovation_platforms/index.html

266 E4tech: *A Review of the UK Innovation System for Low Carbon Road Transport Technologies*, March 2007, is being published alongside the LCTIS and is available in full at
<http://www.dft.gov.uk/pgr/scienceresearch/technology>



7.53 Finally, Budget 2007 announced a review, to be led by Professor Julia King and Sir Nicholas Stern, to examine the vehicle and fuel technologies which over the next 25 years could help decarbonise road transport. This will identify options for moving towards the Government's longer-term objective to reduce average new car emissions to 100gCO₂/km. The review will report its initial findings at the time of the 2007 Pre-Budget Report.

Low carbon innovation in other sectors

7.54 While the road sector currently accounts for the bulk of emissions from the transport sector, rail, shipping and aviation also contribute significantly.

7.55 For aviation the Government is already providing around £45 million per year, match-funded by industry, for the National Aerospace Technology Strategy (NATS) to help develop the technologies to maintain UK competitiveness in aerospace. This is in addition to the £5 million that is being provided for the OMEGA project (Opportunities for Meeting the Environmental Challenges of Growth in Aviation) looking at radical options to mitigate the climate impacts of aviation. The EU Framework Programme 7, commencing this year, will also provide significant aerospace backing, including a major new Clean Sky Joint Technology Initiative combining EU and aerospace industry funding.

7.56 In the rail sector the Government is working in a number of ways to improve environmental performance. Examples include implementing regenerative braking, optimising the rail network for energy efficiency, trialling hybrid trains, and considering the longer-term role that hydrogen fuel cells could play. In addition the Government is setting challenging targets for train mass reduction and energy efficiency improvement for new trains and is requiring flexibility to be built in, so that the cost of installing future new technologies such as fuel cells will be minimised. The Government is reviewing the case for further electrification of the network taking account of environmental, economic and affordability issues. It will set out its conclusions on this and rail's broader environmental performance in the long-term rail strategy to be published in summer 2007.

7.57 Though an efficient way to move bulk freight, shipping represents a growing source of carbon emissions. The Government commissioned AEA Energy & Environment and Newcastle University to advise on technology options available to improve the environmental performance of shipping²⁶⁷. Technologies identified include biofuels and sky sails, as well as technologies to improve the fuel economy of commercial shipping. Over time, carbon pricing approaches should be extended to the shipping sector as well as other modes of international transport. To further this aim, the UK is contributing to an International Maritime Organization work plan to identify and develop the mechanisms needed to achieve the limitation or reduction of carbon emissions from international shipping. At the same time, the UK will consider the potential scope for regional emissions trading schemes and other economic instruments that may prove effective.

267 AEA Energy and Environment: *Low Carbon Commercial Shipping*, February 2007, <http://www.dft.gov.uk/pgr/scienceresearch/technology>

Encouraging Behavioural Change

7.58 The Stern Review noted that a third important dimension to the policy framework required to reduce emissions is to enable people to adopt low carbon behaviours. The policies presented below are aimed at achieving this through raising awareness of the issues and identifying and removing barriers to behavioural change.

Promoting the use of Public Transport

7.59 As highlighted in the Energy Review Report the Government recognises the important role public transport has to play in reducing emissions. This is why we are putting record amounts of investment into public transport to give people a real alternative to using their cars. As a result, the UK now has the fastest growing railway in Europe²⁶⁸ and more journeys are now being made on the network than at any other time in the last 60 years.

7.60 As part of this commitment to providing real alternatives to the car, local and central Government are now spending around two and a half billion pounds a year to provide bus services. The Government is also extending the scope of Concessionary Bus Travel across England, guaranteeing everyone aged 60 and over and disabled people, free off-peak travel on all local buses anywhere in England from April 2008.

7.61 Availability of bus travel is increasingly important for giving people choice and encouraging greater use of lower-carbon transport. In December 2006 the Government published proposals for a modernised national framework for bus services, in *Putting Passengers First*²⁶⁹. These proposals, along with other measures to help tackle congestion and improve public transport, will be included in a draft bill which is due to be published shortly.

7.62 *Putting Passengers First* also highlighted the potential case for refocusing bus subsidy to provide a more direct linkage with the Government's priorities of tackling congestion, improving the environment and accessibility. The DfT is considering these issues further with interested parties, including the scope for refocusing the current subsidy based on fuel consumption into one which is more directly linked to performance and environmental outcomes.

7.63 In addition to the investment outlined above, the Government has also earmarked up to £200 million per year from the Transport Innovation Fund to support packages of measures that combine demand management such as road pricing, with modal shift, smarter travel choices and better bus services²⁷⁰. Already ten areas have been awarded more than £14 million of pump-priming funding to support the development of proposals. The first bids are expected to be submitted in July 2007. These proposals are expected to reduce carbon and other emissions by improving services and reducing road congestion.

268 DfT: *Ten-year European Rail Growth Trends: A study by the Association of Train Operating Companies*, [http://www.atoc-comms.org/admin/userfiles/](http://www.atoc-comms.org/admin/userfiles/Ten%20Year%20European%20Rail%20Growth%20Trends%20July%202006.pdf)

Ten%20Year%20European%20Rail%20Growth%20Trends%20July%202006.pdf

269 DfT: *Putting Passengers First*, <http://www.dft.gov.uk/pgr/regional/buses/secputtingpassengersfirst>

270 DfT: *Transport Innovation Fund*, <http://www.dft.gov.uk/pgr/regional/tif/>



Smarter Travel Choices

7.64 The Government has put in place a substantial programme to promote changes towards more sustainable patterns of travel behaviour using a range of measures collectively known as Smarter Choices. These include workplace, school and personalised travel planning, travel awareness campaigns and marketing and offer great potential to reduce congestion and carbon emissions.

7.65 Local authorities are the key delivery agents for using Smarter Choices, primarily through the land-use planning system and as part of their 5 year Local Transport Plans (LTPs). The Government is also supporting the work of the new National Business Travel Network to encourage more businesses to develop voluntary travel plans which can reduce car use to the workplace.

7.66 By 2008, the Government will have provided over £100 million of support for its *Travelling to School* Initiative. The initiative's objective is to ensure every school in England has an active travel plan in place by 2010. The funding includes £7.5 million each year to fund a network of 250 local authority based travel advisers to work with schools and help them develop and implement school travel plans. By summer 2007 over 50% of schools in England are expected to have an approved school travel plan and more than £70 million in small capital grants will have been allocated.

7.67 In March 2007 the DfT announced the results of its new scheme to encourage more primary school children to walk to school through "walking buses" or alternative walking initiatives. There was an extremely good response with more than 3,200 primary schools in England (more than 1 in 6) being awarded a grant. As a result, we expect to see the number of walking buses across England triple, with significant health, environmental and congestion benefits. The Government has also published *Walking and cycling: Links to Schools*, which promotes to local authorities the success and achievements of linking residential areas to schools via the National Cycle Network, helping to demonstrate the possibilities and potential of active travel.

7.68 As set out in the *Energy Review Report* the Government has a continuing commitment to promoting active travel, encouraging people to view cycling and walking as viable alternatives to the car. The Government doubled Cycling England's budget in June 2006. And we have now begun the national roll-out of *Bikeability*, the new standard for cycle training, taking cycling proficiency into the 21st Century. The on-road element to this training will provide greater reassurance about safety to parents and children, and so further increase cycling.

7.69 We will continue to assess the potential of Smarter Choices measures with ongoing programmes such as the Sustainable Travel Towns initiative²⁷¹, to provide further evidence of the benefits, and guidance to others on how to implement such measures. Although not complete, initial results are promising, and show that in the target population area, public transport use

271 DfT: *Sustainable travel demonstration towns*,
<http://www.dft.gov.uk/pgr/sustainable/sustainabletraveldemonstrati5772>

has increased by over 10%, with car use among the targeted population decreasing by a commensurate amount.

Raising Awareness – Communications Campaign

7.70 Building on our strategy to improve the overall environmental performance of transport we are also keen to raise awareness amongst motorists of what they can do to help reduce emissions. The scope for reductions from individual motorists taking action is considerable. For example, if everyone purchasing a brand new car chose the most fuel efficient car within its class and price range, carbon emissions from new cars could be reduced by 24%²⁷². If all drivers in the UK adopted smarter driving techniques carbon emissions from the fleet could be reduced by around 8%²⁷³.

7.71 To promote these benefits, a consumer-facing communications campaign has been developed to cover smarter driving and new car purchasing. The Smarter Driving strand was launched in March as the first part of the Government's *Act on CO₂* brand. The campaign will be rolled-out over the coming months and will include advertising on Television and radio, in national and motoring press, as well as on-line activity targeted at drivers and new car purchasers.

7.72 The Smarter Driving strand of the campaign focuses on existing car drivers and complements the work of the Driving Standards Agency (DSA) to include eco-safe driving in the L-test for all new drivers from 2008²⁷⁴. Advice and training on eco-driving for van and HGV drivers is already provided through DfT's SAFED (Safe and Efficient Driving) programme.

7.73 The car purchasing element of the campaign will build on the introduction in 2005 of the colour-coded fuel economy label for new cars, linked directly to Vehicle Excise Duty (VED) carbon emissions bands now found in the majority of new car showrooms.

7.74 We are also making information available to consumers about the carbon impacts of their journeys through our award-winning journey planner Transport Direct²⁷⁵. Currently, information is available on the carbon impact of car journeys. By Summer 2007 we will launch a service that compares the relative carbon impacts of different travel modes.

Other measures

7.75 In freight, the Government's Sustainable Distribution Fund successfully encourages efficient operating practices in the logistics and haulage industry, in addition to the Government freight grant scheme to encourage the use of rail and water freight instead of roads. Together these deliver the Government's strategy to reduce the environmental impact of freight by minimising the number of vehicles in use and the impact of the remaining vehicles.

272 This is based on 2005 registration data and WhatCar? classifications.

273 This is based on trials undertaken by the Driving Standards Agency (DSA). The fuel cost saving is calculated using fuel prices taken on 5/1/2007. The carbon emissions were calculated using 2005 car and taxi fuel sales figures from *Transport Statistics Great Britain 2006*.

274 Smarter or Eco-Safe Driving is a style of driving that helps the environment by reducing fuel consumption and emissions whilst contributing to road safety.

275 DfT: *Transport Direct*, <http://www.transportdirect.info>



7.76 Effective planning policies can help shape the places in which we live and work to promote sustainable patterns of development and economic growth. Influencing the location and design of new development can reduce the need to travel, particularly by car, minimising transport energy demand and impacts on the environment and climate change. The Government recently sought views on a supplement to *Planning Policy Statement 1 (PPS1): Delivering Sustainable Development*. The consultation document *Planning and Climate Change* sets out how spatial planning should contribute to reducing emissions, including consideration of the transport impacts. Further details are available in chapter 8.

7.77 Aviation carbon offsetting, whilst not a substitute for the Government's wider policy on aviation, is a valuable complementary measure to raise awareness and enable the public to mitigate the impacts of their travel. The Government has taken the lead, introducing an offsetting scheme for all ministerial and official air travel. The scheme is expected to offset up to 100,000 tonnes of carbon dioxide annually. The Government has also recently consulted on a Code of Best Practice for offsetting to ensure that schemes offer a robust and verifiable service for consumers.

7.78 To ensure that the policies outlined above take account of public attitudes and are targeted in the most appropriate way, we are also conducting research to improve our understanding of the key issues affecting public attitudes and travel choices. The DfT has embarked on a long-term programme of social research that will provide an in depth understanding of public engagement with climate change issues and transport.

Conclusion

The combination of these policies means transport can contribute to a substantial reduction in carbon emissions

7.79 This package of savings is consistent with Stern's recommendations, and includes policies to reduce emissions from transport in the short-term, affect behaviour change into the medium-term and bring on the required technologies in the longer-term for transport to make a significant and meaningful contribution to the UK's climate change goals.

7.80 Our objective to secure a regulatory regime to improve the fuel efficiency of new cars will further reduce carbon emissions in the Transport sector by 1.8-4.1MtC per year by 2020. If the above conditions were met then the Road Transport Fuel Obligation would be raised beyond 5% by 2010. If, for example, it were to rise to 10% by 2015, the UK could reduce carbon emissions by up to a further 1MtC a year by 2020. Further reductions can also be expected from the aviation sector. For example, if aviation were included in the EU Emissions Trading Scheme on similar terms to those indicated in the Commission's proposal, then we could expect to see reductions from UK domestic aviation in the region of 0.2-0.4 MtC a year in 2020²⁷⁶. These policies

²⁷⁶ This figure does not include any savings resulting from including international aviation in the EU ETS, the impact of which on the UK inventory will only be quantifiable when agreement is reached on how to allocate responsibility for such emissions. It is also worth noting that in 2005 domestic aviation accounted for only 0.4% of the UK's total carbon dioxide emissions.

could therefore have a total impact on UK carbon emissions of 2.0-5.5 MtC a year by 2020, and so ensure that the growth in domestic transport emissions is counteracted.

7.81 In addition to these we would expect further savings from our policies to encourage behaviour change and promote technology development. For example, although more difficult to quantify, improvements to public transport, encouraging people to make more sustainable travel choices and fleet programmes to demonstrate the potential of new technologies will help reduce carbon emissions. Finally, we have set out that we will continue to investigate the costs and benefits of including surface transport in the EU ETS. Much depends on the detail of how such a scheme was designed, but our initial analysis suggests that it could reduce UK carbon emissions by around 1-2MtC per year by 2020.

7.82 The scale of the challenge facing transport is considerable, and success will rely on all parts of society playing their part: individuals, businesses, Governments and international organisations such as the EU and the UN. If we are to succeed we need to secure modern, efficient and clean transport systems that allow businesses to operate effectively, goods to be transported efficiently and people to access services and make the most of their leisure time, all of which needs to be achieved whilst meeting our environmental objectives.

TRANSPORT: SUMMARY OF MEASURES

We will:

- **continue to support the European Commission's recent proposal to include aviation in the EU Emissions Trading Scheme (EU ETS);**
- **support a move to demanding mandatory fuel efficiency targets for new vehicles and lead efforts to ensure that the inclusion of surface transport in the EU Emissions Trading Scheme is given serious consideration;**
- **deliver around 1 million tonnes of yearly carbon savings through the Renewable Transport Fuel Obligation and consider the future evolution of the obligation in the light of consultation responses and the EU biofuels targets;**
- **invest in low carbon technologies through the Energy Technologies Institute, help support new vehicle technologies through a new initiative with the Technology Strategy Board, and use public sector procurement to assist in fleet demonstrations of new technology; and**
- **encourage changes in behaviour to reduce emissions from transport, through fiscal incentives, further development of smarter travel choices and consumer communications campaigns.**

The combination of these measures could produce yearly domestic carbon savings of 2.0-5.5 MtC in 2020.



CHAPTER 8

Planning

The planning system plays an important role in delivering the necessary energy infrastructure to meet our national needs. In so doing, it has to integrate national, regional and local benefits; economic, environmental and social objectives; and possible tensions between the interests of individuals or local communities and the needs of society as a whole. In The Energy Challenge, the Government set out the importance of the energy planning system²⁷⁷ to the delivery of our energy policy goals and set out proposals we would take forward to make improvements.

8.1 This chapter sets out:

- The cost, delay and uncertainty created by the energy planning system and the impact on our energy policy goals;
- the causes of this cost, delay and uncertainty;
- the progress we have made in implementing the package of planning measures set out in The Energy Challenge; and
- how the further and wide ranging planning reforms proposed in the planning White Paper 2007, *Planning for a Sustainable Future*²⁷⁸, will impact on the energy planning system.

The impact of the energy planning system on our energy policy goals

8.2 We face a significant challenge in delivering substantial new energy infrastructure. In electricity, we will need around 30-35GW of new generating capacity over the next two decades with two thirds of this by 2020. There will also need to be substantial investment in transmission and distribution networks. To the extent that low carbon electricity projects are stalled by the planning process, this would slow progress in tackling climate change.

8.3 In gas, as our reliance on imports increases, we need more import and storage infrastructure if we are to maintain reliable and affordable supplies of energy. If developers cannot secure planning permission for electricity generation projects and gas supply infrastructure projects in sufficient numbers in a timely fashion, the UK could be exposed to rising security of supply risks, with the potential for upward pressure on energy prices.

²⁷⁷ This report uses the term “energy planning system” to refer to the sum of all the different regimes under which energy infrastructure projects secure consents. In many instances these consents will be deemed to also grant planning permission.

²⁷⁸ <http://www.communities.gov.uk/planningwhitepaper>

8.4 The Government has made a number of improvements to the planning system in recent years, both for decisions taken by local authorities and those taken by central Government. However it is clear that the context for the planning system is becoming even more challenging. Although progress has been made by local authorities in handling planning decisions, more than 65% of firms in the UK believe that more should be done, and the recent Barker Review on land-use planning found that there were still major delays associated with central Government decisions²⁷⁹.

8.5 Planning is consistently one of the top six concerns for inward investors in the UK²⁸⁰. A 2006 report by Ernst and Young on the relative attractiveness of countries for investment in renewables found that the UK's position had fallen because of concerns about planning issues²⁸¹.

8.6 The current energy planning system is delivering decisions that have been extensively considered, and provides for public participation in decision-making, but there are several key challenges that present risks to achieving our energy policy goals:

- **It can take too long.** On average, where a public inquiry has been held it has taken 3 years to secure consent for electricity infrastructure projects²⁸²;
- **It can create too much uncertainty for communities, business and developers.** While consent applications remain undecided it can blight the local community, affecting local property prices and the potential for other development. Additional uncertainty is created where planning committees in local authorities ignore the advice of their planning officers;
- **It can be difficult and costly for local government, NGOs and local people – and particularly people from hard-to-reach groups – to participate effectively in the process and make their views heard.** This is in part because of the length of time inquiries can take and the expense involved in participating in them. For example, the direct inquiry costs for the Sizewell B public inquiry were £30 million²⁸³. This means that those with the most resources, or the best knowledge of the system, can sometimes have the greatest say in decisions. For other participants, such as local authorities and community groups, the cost of participation can act as a disincentive to involvement in the process, reducing the accessibility of the energy planning system; and
- **It can have knock-on effects for the UK energy market and wider economy.** In extreme cases, the cost and uncertainty can deter the private sector from proposing projects that would improve the reliability of our supplies and in some cases reduce carbon emissions. Investors may instead choose to make their investments in other countries, to invest in lower-risk options such as gas-fired power stations, for which planning consent has historically been easier to secure, or to delay or postpone investments. The costs of inquiries ultimately feed into higher prices for

279 Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf)

280 Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf)

281 Ernst and Young LLP: *Renewable Country Attractiveness Indices*, November 2006

282 DTI Analysis: Electricity Development Consents Team

283 The Energy Challenge, DTI, July 2006, Cmd 6887. The inquiry for this project was especially lengthy and is considered by some to be longer than might be anticipated in the future, given subsequent improvements in inquiry procedures



electricity and gas for consumers, with potential adverse effects on international competitiveness.

8.7 There are inherent difficulties in making accurate assessments of the cost, delay and uncertainty created by the planning process. Not all delays in the completion of new infrastructure can be attributed to planning hold-ups, for example:

- Projects might experience technical delays or financing problems;
- developers sometimes do not provide all the information and environmental analysis necessary to support the proposed development²⁸⁴; and
- local community engagement on projects is not always well handled by developers.

8.8 However, the evidence the Government identified through the Energy Review process suggests that obtaining planning permission can be a significant problem²⁸⁵, and that the current planning system is a key contributing factor.

Impact on gas supply infrastructure projects

8.9 The market is already responding to our need for new infrastructure to help us import gas, and to store it until it is needed, with some £10 billion in planned and actual private investment in gas supply infrastructure between 2005 and 2010.

8.10 However, there is a risk that planning delays or unpredictable decisions will prevent new infrastructure of national significance coming on line in a timely fashion. In 2006 there were four major decisions²⁸⁶ made on gas supply infrastructure projects, with three of these being refused by local authorities. One of these decisions is currently being appealed, and others may be in the future. As with any appeal, the reasons for refusal will need to be examined within the specific circumstances of the planning decision.

8.11 Of recent applications that have been considered by local authorities for gas storage developments, it has taken an average of 25 months from an application being made to a final decision on a project (including inquiry processes)²⁸⁷. However, in one case, a decision is still outstanding 36 months after application²⁸⁸. Extensive delays can create a climate of uncertainty, which often makes it hard to secure capital for a project, or to continue financing a project that may be subject to years of delay before a final decision is made. Delays to new infrastructure projects can also affect the demand/supply balance for gas, which although not necessarily leading to shortages, can contribute to higher energy prices.

284 An obligation under European legislation: Consolidated EIA Directive. Directive 85/337/EEC as amended by 97/11/EC and 2003/35/EC

285 The Energy Challenge, HMG Cmd 6887, July 2006

286 Stublach gas storage project granted permission by Local Authority June 2006, Caythorpe gas storage project application refused by Local Authority June 2006; Welton gas storage project refused by Local Authority February 2006; Canvey Island LNG project refused by Local Authority September 2006

287 Aldbrough submitted June 98, final decision February 00 (approved); Holford submitted February 02, decision May 04 (approved); Welton submitted November 03, decision February 06 (refused)

288 It is important to note that a major factor causing delay in this case (Preesall) was that there were specific concerns raised about the original environmental information provided by the developer and whether it was compliant with European requirements.

Impact on electricity infrastructure projects

8.12 Although securing planning permission can be difficult for all types of electricity generation, our analysis²⁸⁹ shows that low carbon technologies face particular difficulties. For example it takes on average over 20 months to secure planning consent for a large onshore windfarm²⁹⁰. In March 2006, there were 24 wind projects, with a combined capacity of 1.2GW that had already been under consideration in the consent regime for more than 21 months²⁹¹. In fact at the start of 2007, 7.2GW of windfarms were awaiting a consent decision²⁹².

8.13 The 7.2GW figure covers all sizes of windfarms and the problem of delay, cost and uncertainty applies to smaller windfarms as much as bigger ones. Smaller projects (under 50MW) are consented under the Town and Country Planning Act system. On average, decisions for smaller windfarms are taking 10 months in England, 27 months in Wales and 14 months in Scotland²⁹³, against a target in England for local authorities to determine 60% of all "major applications"²⁹⁴ within 13 weeks.

8.14 As part of our analysis of the nuclear question for the Energy Review and the consultation document published alongside this White Paper, we examined the evidence on planning inquiries for nuclear power stations and found that proposals in the past have also encountered significant delays in securing planning consent²⁹⁵. For example, the Hinkley Point C public inquiry lasted more than 180 days and covered many of the same generic health and safety issues as the Sizewell B inquiry even though it was based on the same power station design.

What causes the cost, uncertainties and delays?

8.15 Since the Energy Review Report was published, two further reviews commissioned by Government have reported²⁹⁶. Both included an examination of the issue of planning for major infrastructure. They concurred with the findings of the Energy Review Report in identifying a number of major causes of delay, uncertainty and cost in the planning systems for major infrastructure projects:

- **The relative significance of Government policies and the balance of priorities can be unclear.** Although the Government has taken action to articulate national energy policy, inspectors and other participants in the planning system must balance this against the full suite

289 DTI Analysis 2006: Electricity Development Consents Team

290 DTI Analysis 2006: Electricity Development Consents Team

291 BWEA: *Onshore Wind – Powering Ahead*, March 2006

292 BWEA: *Real Power: Issue 8*, December 2006. This figure represents projects awaiting consent under both the Electricity Act and Town and Country Planning Act across all of the UK. A significant number of these projects are in Scotland. Scotland already has developed plans to modernise their planning system to make it more efficient, avoiding delays and uncertainty where possible, while ensuring community interests are fully considered.

293 BWEA: *Onshore Wind – Powering Ahead*, March 2006

294 For non-residential developments, a major application is one where the floorspace to be built is 1,000 square metres or more, or the site area is 1 hectare or more, http://www.communities.gov.uk/pub/642/DevelopmentcontrolstatisticsEngland200506_id1503642.pdf

295 As indicated in chapter 5, Government is consulting on whether new nuclear build should have a role to play.

296 Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf); Eddington Transport Study: http://www.hm-treasury.gov.uk/independent_reviews/eddingon_transport_study/eddingon_index.cfm



of Planning Policy Statements when assessing the need for and the environmental consequences of a project. It is not always clear which elements of this framework should carry the most weight in the assessment of any given case. Moreover, the costs of energy developments tend to be local, tangible and short-term, whereas the benefits are *diffuse* (gas storage projects provide benefits for users of gas across the entire country), *intangible* (it is difficult to associate reliability of the entire UK electricity system with the building of a single power station) and *long-term* (power stations produce electricity for a long period of time, whereas the main impact on the local community is during the construction period). This situation creates uncertainty for developers as to how local authority decision makers and consultees will balance the local impact of a project against the national benefits.

- **The system is cumbersome and complex with multiple decision makers.** As highlighted in the Energy Review Report²⁹⁷, the energy planning system is a complex mix of consent regimes, with different local and national accountabilities. For example, offshore windfarms require consent under the Electricity Act from the Secretary of State for Trade and Industry, and consent from the Secretary of State for Environment, Food and Rural Affairs for a “FEPA licence²⁹⁸”. Sometimes separate consent will also be sought from the local planning authority for onshore infrastructure needed to connect the windfarm to the grid.
- **Lengthy inquiry periods.** The current system, whether decisions are made by Ministers or local authorities, is based on often lengthy adversarial cross-examination, and it is difficult to fully exclude certain issues from inquiry, even if they have been established as Government policy, for example the national need for certain types of development.
- **Two separate phases of decision-making: recommendations by inspectors and then final Ministerial decision.** Both the preparation of the Inspector’s report of a public inquiry and the subsequent Ministerial decision can be subject to delay, and new matters and evidence that arise during this period may need to be considered. For example, it took the judge appointed as inspector for the Sizewell B power station inquiry over 22 months from the close of the inquiry to provide his report to the Secretary of State, and then a further four months for the final decision.
- **Legal challenge.** Legal challenges can also be costly and time consuming and create extra uncertainty for local communities and developers. However, there is a clear need to allow legal challenge to ensure decisions are made in accordance with legal principles and that procedures operated by decision-makers are fair.
- **Quality of applications.** At present, most applications for consent to construct infrastructure of national significance are well prepared. However, some inquiries can be delayed because of poor preparation or inadequate consultation. Thorough preparation by the developer and early engagement with key parties including affected local communities, local

297 The Energy Challenge, Table 7.1, Pages 138-141

298 A FEPA licence is a licence under the Food and Environmental Protection Act 1985

authorities, and relevant public bodies such as the Environment Agency, English Heritage and the Highways Agency, as well as with the determining body, are essential if the project development process is to be effective and the planning system is able to deliver decisions efficiently.

Immediate improvements to the Energy Planning System

8.16 The Energy Review Report, in 2006 set out a comprehensive package of measures that could be implemented swiftly while the Government considered proposals for a more fundamental overhaul of the planning system for nationally significant infrastructure. Work has progressed according to plan. The package was based on three principles:

- Improving the strategic (i.e. national policy) context against which individual planning decisions should be made;
- introducing more efficient inquiry procedures within the current consent regimes; and
- more timely decision-making.

8.17 Since the Energy Review Report was published in July 2006 we have already put in place the following:

- The statement of need on renewable generation which was published as part of the Energy Review Report (and which is included in the renewables section of chapter five);
- improved guidance for developers on Combined Heat and Power (CHP);
- the commitment to appoint high-powered inspectors for the most complex and controversial energy proposals; and
- updated rules for inquiries held to consider applications for large electricity projects.

Improving the strategic context

Planning Policy Statement on Climate Change

8.18 We committed to preparing a wide-ranging Planning Policy Statement (PPS) on Climate Change. It will provide clarity on national policy on climate change issues. Regional and local planning bodies will be expected to take the policies in the PPS into account in the preparation of regional spatial strategies (including the spatial development strategy for London) and local development documents. We have recently consulted on a draft of the Statement which puts the national need to cut carbon emissions and to secure renewable and low carbon energy, centre stage of what is expected from planning. It does this through the following:

- Underlining that applicants will no longer have to demonstrate either the overall need for renewable energy or for their particular proposal to be sited in a particular location;
- creating the expectation amongst applicants that any substantial new proposed developments would need to source a significant proportion of their energy supply from low carbon sources (including on and off-site renewables);



- encouraging planners to help create an attractive environment for innovation and in which the private sector can bring forward investment in renewable and low carbon technologies; and
- giving a clear steer to planning professionals and local authority decision-makers, that in considering applications they should look favourably on renewable and energy developments.

8.19 The Government is currently considering responses to the consultation on the draft PPS, which closed on 8 March 2007, and will publish the final PPS later in 2007. Following publication of the final PPS, the Government will be publishing best practice guidance to accompany the Statement. In finalising the PPS and accompanying guidance, we will look to ensure consistency with the Government's energy policies for tackling climate change set out in this White Paper.

Guidance for developers of electricity infrastructure projects

8.20 There is clear evidence that where developers properly understand how the consenting system operates, and grasp the benefit of early engagement with local communities, that this is reflected in lower costs, fewer delays and less uncertainty in the planning process²⁹⁹. Therefore, we gave a commitment in the Energy Review Report to prepare guidance on the electricity consents process.

8.21 Although the procedures set out in the guidance are not new, it is the first time they will have been set out in this consolidated form. It is also intended that the guidance should be of use to statutory consultees³⁰⁰, environmental interest groups, and anyone with an interest in the energy planning system, including members of the public.

8.22 We recently launched a consultation on this guidance, which covers a number of important areas:

- Flowcharts of how the process operates, from pre-application to decision;
- best practice advice for developers;
- an explanation of the scope and requirements of the Environmental Impact Assessment Directive³⁰¹;
- applications, publicity and consultation requirements;
- planning conditions and associated works; and
- the decision making and appeals processes.

8.23 The Government believes that proposals for grid upgrades, where they relate specifically to new generating capacity, should be considered as part of the same project. Although there are separate application processes for each, where possible such applications should be considered side-by-side. This assists the consents process and will help to ensure the timely construction of both power stations and the overhead lines needed to connect them to the grid. It also means that where practical, both applications can be considered under the same public inquiry. The guidance explains how developers should approach this issue.

299 Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf)

300 Statutory consultees will differ depending on the consent regime and the location of the development. They are the parties with which the developer must consult, for example, the Environment Agency

301 Transposed into legislation for England and Wales in the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000

8.24 We plan to issue the final version of the guidance in autumn 2007.

Guidance for power station developers on Combined Heat and Power

8.25 As part of Government policy to promote good quality CHP where viable, there is an obligation on developers of large power stations to consider opportunities for CHP, including community heating, when submitting their applications for consent.

8.26 In December 2006, the Government issued new guidance for developers on meeting their CHP obligations³⁰². The guidance takes into account comments gathered during the formal consultation process in 2004, and also informal discussions with stakeholders since the publication of The Energy Challenge. It is designed to make it easier to identify opportunities for CHP and where it is clear there are no nearby potential heat customers, to help developers more efficiently meet their obligation. The key improvements to the guidance are:

- Providing more information on “heat maps” to allow developers to explore opportunities for CHP more easily;
- setting out more clearly how developers can demonstrate that they have considered the opportunities for CHP;
- rationalising the number of contacts to discuss how best to exploit CHP opportunities; and
- providing case study examples of how developers have in the past successfully exploited CHP opportunities.

Improving the resilience of overhead power networks

8.27 The resilience of the electricity networks is important in ensuring the reliability of our energy supplies. The vast majority of interruptions to electricity supplies that do occur in the UK are as a result of transmission or distribution issues. The Government believes that a better balance can be struck between a flexible approach for modest changes to existing overhead lines and the need for new consents for more significant works. Although minor upgrades are often controversial and do not have significant environmental effects, they are currently required to comply with the full consent process.

8.28 In December 2006, the Government launched a consultation that sought views on, amongst other things:

- Allowing the use of “design successors” without the need for a renewed consent³⁰³;
- allowing minor changes to existing infrastructure in National Parks and Areas of Outstanding Natural Beauty with the acquiescence of the local planning authority, without requiring fresh consent;
- maintaining the current requirement for lines within Sites of Special Scientific Interest to be subject to the full consent process; and
- the costs and benefits assessment of such changes.

302 <http://www.dti.gov.uk/energy/markets/consents/guidance/page27939.html> (an English and Welsh version is available)

303 The term “design successors” is used to refer to the introduction of new components that perform broadly the same function as their predecessors, but improve the resilience of overhead lines because of the designs of the new components. Key examples are insulated conductor systems such as Aerial Bundled Conductors or Compact Covered Conductors.



8.29 The proposals in this consultation are intended to allow for better maintenance of the existing overhead transmission and distribution lines, and will allow some minor upgrades to be undertaken without the administrative burdens and potential delays of requiring a new consent under Section 37 of Electricity Act 1989.

8.30 Following this consultation, the Government will issue a response to views expressed by consultees. The intention is to finalise this response during 2007, and then to prepare Exemption Regulations to take effect as soon as reasonably possible thereafter.

Introducing more efficient inquiry procedures

Updated inquiry rules for large electricity projects

8.31 In 2006, we committed to introducing streamlined inquiry rules in England and Wales in April 2007 that took recent best practice³⁰⁴ into account. On 9 November 2006, we launched a consultation on proposed new rules for these inquiries³⁰⁵. In the light of the consultation, we made amendments and laid the new Rules, "The Electricity Generating Stations and Overhead Lines (Inquiries Procedure) (England and Wales) Rules 2007", in Parliament. The Rules came into force on 6 April 2007³⁰⁶.

8.32 The improvements to the Rules focus on the following areas:

- **Increasing the information made available to the Inspector and inquiry participants at the pre-inquiry stage.** For example by requiring those who objected to the application to register at an early stage (indicating the intended degree of participation), in order to be automatically entitled to appear at the inquiry. This will help the inspector propose or set a realistic timetable for the inquiry, and help it to be run more efficiently.
- **Designing improved pre-inquiry procedures.** For example, by enabling the Secretary of State to require that the applicant and relevant planning authority prepare a statement of common ground. This will clearly identify issues on which common agreement has been reached and therefore should not need to be discussed in depth in the inquiry proper.
- **Giving the Inspector more discretion to design a fit-for-purpose inquiry procedure.** For example, giving him the power to direct that evidence on certain specified issues is given primarily in writing (although participants may make limited oral submissions on these issues at inquiry). This should help lead to shorter and more efficient inquiries; and
- **Enabling e-communication to help reduce administrative burdens of inquiries.**
- **Reducing the standard periods between the receipt of the application and commencement of the inquiry, although these periods may, in individual cases, be extended.**

8.33 The new Rules also include specific new provisions to cater for inquiries into applications under the Electricity Act for offshore generating stations.

304 In 2005, the Government introduced new inquiry rules for Major Infrastructure Projects considered under the Town and Country Planning Act regime. <http://www.opsi.gov.uk/si/si2005/20052115.htm>

305 <http://www.dti.gov.uk/energy/review/implementation/electricity-act-inquiry/page35205.html>

306 These Rules can be found at <http://www.opsi.gov.uk/si/si2007/20070841.htm> and Guidance to accompany them at <http://www.dti.gov.uk/files/file38845.pdf>

Streamlining of onshore gas consents regimes

8.34 The current process for securing consent for gas infrastructure projects is complex, with various consents routes, and can be very protracted. There is also concern that not enough weight is placed on the national need for such infrastructure projects³⁰⁷. Industry cite the number of decisions that have had to be appealed as evidence of this, although there may be additional reasons for applications being turned down.

8.35 The Government is consulting on proposals to address this need for simplification as part of the planning White Paper 2007, *Planning for a Sustainable Future*. This sets out proposals for the new planning system and consults on rationalising the regime for nationally significant gas supply infrastructure projects in England to bring all decision making under the proposed independent infrastructure planning commission³⁰⁸. This is discussed later in this chapter.

8.36 We recognise that any changes to legislation would not aid those projects that are already engaged in the planning system, or which are close to engaging in it, because we expect it will be two years before the new regime is operational. However, we remain committed to taking any action now where we can to make the consenting arrangements more efficient.

8.37 Some developers are exploring an alternative approach by consenting applications for gas storage developments under the Gas Act 1965³⁰⁹. There is currently no existing guidance on this legislation, which is creating difficulties for an increasing number of developers. The regime is also unfamiliar to other interested parties, for example, those living in areas in which a storage facility is proposed. Therefore, we are publishing alongside this White Paper, a consultation seeking views on new draft guidance on the Gas Act 1965. Based on this consultation, we will aim to publish guidance later this year. Our objective is to help all parties to engage in the consenting process so that it can be more efficient in considering applications.

Appointment of inspectors

8.38 The appointment of an individual to act as inspector for an inquiry is an important decision that can have a significant impact on the timely and efficient running of an inquiry. Any inspector needs to be well versed in the running of inquiries or similar processes; if they do not adhere to the procedures as set down in legislation there is a high risk of successful challenge to the decision on whether or not to grant consent for the project.

8.39 Based on feedback gathered during the Energy Review, in particular from potential developers, we believe that there could be benefits under some circumstances in appointing a high court judge, barrister or similar individual, who would be able to bring particular rigour to the timetable of any planning inquiry, without compromising the ability of the inquiry to address all the relevant issues. We will take forward our proposal as set out in The Energy Review report to appoint a high-powered inspector from outside of the

307 Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf)

308 In the light of the wider proposals for planning reform, the planning White Paper 2007, *Planning for a Sustainable Future*, consultation question on this topic replaces the proposal made in the Energy Challenge to consult this autumn on gas supply infrastructure.

309 The scope of the Gas Act 1965 is limited to the underground storage of gas by a licensed gas transporter in natural porous strata (i.e. partially depleted oil/gas fields or aquifers, but not salt caverns).



immediate planning community for especially complex and controversial inquiries, if we are satisfied that it would bring benefits.

Timely decision making

8.40 In The Energy Review Report, the Government highlighted that it was considering a number of options for ensuring timely decision making of applications for consent to construct important energy infrastructure. The time taken for Government to make a decision can add considerably to the overall time needed to secure planning consent. For example, it took over four months for a decision to be made on granting consent for the Hinkley Point C power station. An especially lengthy delay followed the second inquiry into the North-Yorks overhead line, where the Inspector submitted his report in December 1995 but a decision was not taken until March 1998.

8.41 We have considered a number of options to provide more timely decision making and more certainty surrounding the decision making process. In the long-term, timetabling of the inquiry and decision making process will be a key element of the fundamental reforms (see below).

8.42 In the short-term, we are giving a voluntary commitment to take decisions on whether to grant consent for applications made under s36 and s37 of the Electricity Act for large electricity infrastructure projects within three months of receipt of the inspector's recommendations. This reflects the time-limit for the determination of applications to construct nationally significant infrastructure projects proposed in the planning White Paper 2007, *Planning for a Sustainable Future*. This should lead to more timely decisions and, combined with the requirement for the inspector to set a timetable for the inquiry, greater certainty over how long the planning process should last for individual projects.

8.43 We would, in certain circumstances, where cases were especially complex, announce a longer decision making deadline as soon as possible upon receipt of the inspector's recommendations. However, we are committed to making decisions as quickly as possible and would expect in most cases to give a decision within the three month deadline.

Fundamental reform of planning for nationally significant infrastructure projects

8.44 The Energy Challenge made a commitment to providing more information on reforms for major projects later in 2006, taking into account cross Whitehall work on planning. The Eddington Study was published on 1 December 2006 and the Barker Review on 5 December³¹⁰. In the Pre-Budget Report, the Government gave a positive response to the proposals in both reports on infrastructure and planning. It also gave a commitment to publish a planning White Paper in Spring 2007, setting out its proposals to take forward their recommendations for reform of major infrastructure planning, including nationally important energy projects. This commitment was reinforced in the 2007 Budget.

³¹⁰ Barker Review of Land-Use Planning: Final Report – Recommendations (http://www.hm-treasury.gov.uk/media/4EB/AF/barker_finalreport051206.pdf) Eddington Transport Study: http://www.hmtreasury.gov.uk/independent_reviews/eddingon_transport_study/eddingon_index.cfm

8.45 The planning White Paper 2007, *Planning for a Sustainable Future*³¹¹, was published in May 2007. The remainder of this chapter summarises some of its key proposals that bear on the energy sector.

8.46 A key component of the reforms proposed in the planning White Paper 2007, *Planning for a Sustainable Future*, is the creation of an independent infrastructure planning commission (hereafter referred to as “the commission”). The commission would examine and take decisions on applications for nationally significant infrastructure projects above statutory thresholds, as well as projects designated by national policy statements or Ministers. Under these proposals there would be three main phases for nationally significant infrastructure:

- **The strategic phase.** The Government would produce national policy statements which would establish the national case for infrastructure development and set the policy framework for infrastructure planning commission decisions. The statements would explain how they integrated strategic economic, social and environmental policy objectives to deliver sustainable development. There would be public consultation on national policy statements, and an opportunity for Parliamentary scrutiny before they were finally adopted. National policy statements would be the primary, but not the only, consideration for the infrastructure planning commission in determining applications for development consent for nationally significant infrastructure projects.
- **The project development phase.** An active pre-application phase that would provide greater certainty for promoters of infrastructure projects and will help ensure all developers more thoroughly prepare applications by:
 - making better advice available to them;
 - requiring them to consult publicly on proposals for development; and
 - encouraging early and effective engagement with key parties such as local authorities and statutory bodies.
- **The decision-making phase.** The commission would examine and take decisions on applications for development consent for nationally significant infrastructure projects, within the framework of the relevant national policy statement. The planning White Paper 2007, *Planning for a Sustainable Future*, envisages that, other than for particularly difficult cases, the commission would work to a statutory time limit of nine months for its examination and decision: six months for examination of the project and three months for determination.

8.47 In addition, the planning White Paper 2007, *Planning for a Sustainable Future*, proposes:

- Harmonising as far as possible, the different consent regimes to create a single application process for these major infrastructure projects;
- streamlining the procedures for examining infrastructure projects of national significance by improving inquiry procedures; and
- improving public participation across the entire process by providing better opportunities for public consultation and engagement.



The strategic phase

8.48 Under the proposals Ministers would have responsibility for developing national policy statements and the extensive work that will go into consulting on and refining them. National policy statements would establish the national case for new energy infrastructure to meet our energy policy goals.

They would also:

- Integrate government objectives and help deliver sustainable development;
- provide a more certain and stable base for investment in infrastructure;
- provide a clear and focused opportunity for consultation and debate on national infrastructure development; and
- enhance ministerial accountability for policy setting.

8.49 National policy statements would be the primary consideration for the infrastructure planning commission in reaching decisions and provide a platform for more efficient inquiries and decisions.

8.50 Given their fundamental role in the proposed new system for nationally significant infrastructure applications, national policy statements will play an important role in providing certainty to developers of the national case for new infrastructure. To achieve this they would need to be credible and well-considered, helping to give them a degree of longevity, given the life of energy infrastructure. However, they would also need to be sufficiently flexible to respond to developments in the market. It will be important for the legitimacy of national policy statements that they are subject to thorough and effective consultation and to Parliamentary scrutiny. Proposals on this are set out in the planning White Paper 2007, *Planning for a Sustainable Future*.

8.51 National policy statements would set out the Government's objectives for the development of nationally significant infrastructure in a particular sector and how this could be achieved in a way which integrated economic, environmental and social objectives. The way in which these objectives would be considered and integrated may require Strategic Environmental Assessment, which could be incorporated in a wider Sustainability Appraisal. They would also:

- Indicate how the Government's objectives for development in a particular infrastructure sector had been integrated with other specific government policies, including other national policy statements, national planning policy, and any relevant domestic and international policy commitments; and
- consider relevant issues in relation to safety or technology, indicate any circumstances where it was particularly important to address adverse impacts of development, and include any other particular policies or circumstances that Ministers consider should be taken into account in decisions on infrastructure development.

8.52 Although it is expected that a number of national policy statements will be produced for the energy sector, some high level issues covered by them will be overarching in nature. Of particular relevance is the fact that it is the Government's policy for the market to decide what energy proposals to bring forward in terms of specific technologies and locations to deliver the Government's objectives of ensuring security of energy supplies and tackling climate change by reducing carbon emissions.

8.53 The final structure of the suite of statements likely to be required for the energy industry has not yet been determined. However, it is expected that an overarching framework for energy national policy statements, and some sub-sectoral national policy statements for specific energy technologies, would be put in place during 2009. Individual statements would contain more information on, for example, the need for a particular technology, as well as the generic safety, economic and performance aspects of that technology. New and emerging technologies, such as carbon capture and storage (CCS), would, where appropriate, be covered within the suite of energy national policy statements, when the case for national treatment of such significant projects has been established. Further details on the Government's proposals for the form and timing of national policy statements will be set out after the consultation on the planning White Paper 2007, *Planning for a Sustainable Future* has concluded.

8.54 Where possible, statements will also contain spatially-specific information on developments, but this will vary from technology to technology. It may be possible to offer generic criteria that will help clarify the required locations for certain technologies – for example, underground gas storage facilities, which require certain geological conditions.

8.55 However, energy national policy statements are likely to be less specific in certain respects than for other sectors, because it will not be possible to be capacity and location-specific; these are matters for potential developers to consider as part of the Government's market based approach to energy policy and energy infrastructure development. With regard to offshore energy, we will aim to dovetail the national policy statements and the Marine Policy Statement envisaged under the Marine White Paper, published in March 2007.

8.56 National policy statements will be the primary consideration for the commission in determining applications for development consent for nationally significant infrastructure projects. They will also have important implications for local and regional planning. Where appropriate, national policy statements would set out the contribution the town and country planning system would be expected to make to facilitate the delivery of infrastructure. They will therefore influence planning decisions taken under the Town and Country Planning Act, such as smaller onshore windfarm projects.

8.57 The current statutory framework for planning requires the preparation of regional spatial strategies and local development plan documents. At present, regional planning bodies and local planning authorities must have regard to national policies and guidance when preparing these regional and local development plans. The planning White Paper 2007, *Planning for a Sustainable Future* proposes that this should be extended to ensure that they also have regard to proposed national policy statements on infrastructure.

8.58 The Government intends that any national policy statements for the energy sector would be developed for the whole of Great Britain or the UK as appropriate. There would be no change to the various devolution settlements on planning and the management of consent responsibilities in each of the devolved administrations. The relevant national policies would be developed



with the full involvement of the Devolved Administrations so as to inform strategy for this infrastructure throughout Great Britain or the UK. Welsh, Scottish and Northern Ireland Ministers would be statutory consultees in the development of relevant national policy statements. The Government anticipates that close working in the development of Great Britain or UK wide policy will mean that the national policy statements will also be reflected in policy and decisions in the Devolved Administrations.

The pre-application stage: Improving the preparation of applications

8.59 The Government believes that public consultation on proposals for major infrastructure projects and early engagement with key parties such as local authorities and relevant public bodies such as statutory environmental and heritage bodies is extremely important.

8.60 The planning White Paper 2007, *Planning for a Sustainable Future*, therefore proposes that before promoters submit an application, they should be required to:

- Consult the public and, in particular, affected land owners and local communities on their proposals before submitting an application to the commission;
- engage with the affected local authority or authorities on their proposals from early in the project development process; and
- consult other public bodies, such as statutory environmental and heritage bodies, regional directors of public health, and relevant highway authorities, as appropriate.

8.61 The infrastructure planning commission must satisfy itself that the promoter has carried out adequate consultation before agreeing to consider an application for development consent for nationally significant infrastructure.

8.62 Where the promoter is required to consult an organisation, that organisation has a responsibility to give its views promptly and not cause unnecessary delays. The planning White Paper 2007, *Planning for a Sustainable Future*, therefore proposes that legislation should impose an upper limit on the time the statutory consultees have to respond to a promoter's consultation.

8.63 The Government proposes that the infrastructure planning commission would issue written guidance on the application process, procedural requirements and consultation, and be able to advise promoters and other interested parties on consultation and the application process as a whole. To ensure that applications are thoroughly prepared and can be considered efficiently, the commission would be able to send back applications which had either not been adequately prepared or not been adequately consulted on.

The decision phase

8.64 The planning White Paper 2007, *Planning for a Sustainable Future* proposes that the infrastructure planning commission would deal with development consent applications for nationally significant energy infrastructure in England and Wales, which exceeded statutory thresholds set out in Box 8.1.

BOX 8.1 ILLUSTRATIVE THRESHOLDS FOR ENERGY INFRASTRUCTURE PROJECTS FOR REFERRAL TO THE INFRASTRUCTURE PLANNING COMMISSION

Nationally significant energy projects

The following energy projects will automatically be referred to the Commission for a consent decision:

(a) Power stations generating more than 50MW onshore – the existing Electricity Act 1989 threshold – and 100MW offshore.

(b) Projects necessary to the operational effectiveness, reliability and resilience of the electricity transmission and distribution network. This would be subject to further definition in the relevant national policy statement.

(c) Major gas infrastructure projects (Liquefied Natural Gas terminals, above ground installations, and underground gas storage facilities). This would be subject to further definition in the relevant national policy statement.

(d) Commercial pipelines of a length that puts them above the existing Pipelines Act 1962 threshold of 16.093 kilometres/10 miles and licensed gas transporter pipelines necessary to the operational effectiveness, reliability and resilience of the gas transmission and distribution network.

Associated works

For energy, the main component of the project (for instance, a gas storage facility, power station or windfarm) is likely to require associated works such as gas pipelines, power lines or sub-stations. The planning White Paper 2007, *Planning for a Sustainable Future* proposes that the commission would be able to treat major projects holistically, considering associated works essential to their construction and operation. For instance overhead lines for power stations or surface access infrastructure would be considered alongside the main project, where these had been agreed with network providers. This would simplify matters for developers and also ensure that the project could be considered in a holistic way by interested parties.

Technological developments (such as the use of carbon capture and storage with electricity generation projects) and changing sectoral circumstances (such as increased dependency on gas imports) can mean that there may also be other types of projects that become nationally significant, and may require a national view.

8.65 The commission would appoint a panel of members (usually three to five) to examine and determine the major applications, but would have discretion, where it did not feel that a full panel would be required, to delegate the examination of smaller and less complex cases to a single commissioner supported by the commission's secretariat.



8.66 The commission would be composed of experts in fields such as national and local government, community engagement, planning, law, engineering, economics, business, security, environment, heritage, and health as well as, if necessary, specialist technical expertise related to the particular sector. The commissioners would be appointed for their individual expertise, experience, ability and diversity of background. They would not be appointed as representatives of particular organisations, interests or political parties.

8.67 The secretariat to the commission would employ individuals with the necessary technical expertise across the infrastructure sectors that the infrastructure planning commission would consider. The commission would also be able to draw on specialist technical advice from external sources where necessary to assist it in the consideration of particular cases. The complexity of energy infrastructure may mean that the commission might need to have dedicated energy planning expertise within its secretariat.

8.68 In considering applications, the commission would gather the majority of evidence in writing, probe it by means of direct questioning, and work to a strict timetable. A specific open-floor stage would be introduced to inquiries to allow interested parties who wished to express their views about the project the opportunity to do so within a defined period of time.

8.69 We expect that the commission would consider around 10 major infrastructure projects a year in total (including energy, transport, water and waste projects) as well as a larger number of less complex cases, such as works necessary to ensure the operational effectiveness and resilience of the electricity transmission and distribution network. However, it is hard to be specific because of the likelihood of fluctuations in the frequency with which major infrastructure projects are brought forward, and there might potentially be peaks of anywhere up to 25 major projects in some years. If, following the consultation on the future of nuclear power in the UK, launched alongside this white paper, the Government concludes that it is in the public interest to allow companies the option to invest in new nuclear power stations, we would expect the commission to determine such cases.

8.70 Technological developments (such as the use of carbon capture and storage with electricity generation projects) and changing sectoral circumstances (such as increased dependency on gas imports) can mean that there may also be other types of projects that become nationally significant, and therefore may require a national view. We would expect the commission to be the decision maker for these types of project. It might also be appropriate for the commission to consider applications that on their own were below the normal thresholds, because they had potential cumulative impacts with other applications above the thresholds. It is therefore likely that a small number of other projects, not covered by the thresholds set out in Box 8.1, might require national decision making.

8.71 DTI Ministers currently take decisions on overhead power line consents and wayleaves. There is a particular issue regarding the future treatment of projects necessary to the operational effectiveness and resilience of the electricity transmission and distribution network, which is a critical factor in the security of our energy supplies.

8.72 The electricity network needs to be robust as new, renewable sources of electricity generation start to be developed to meet our climate change objectives. The energy planning system must be able to take into account and allow for the full implications of the drive towards a greater role for renewable energy and for a more localised pattern of generation and distribution. Each link of the electricity network is critical to the effectiveness and resilience of the network as a whole, and thus to ensuring that we can sustainably and cheaply transport power from generating stations to customers.

8.73 In these circumstances, the Government sees no obvious way to draw a line between national and local projects, although the Government would be interested in views on where such a line could be drawn. The Government is consulting on this issue, as part of the consultation on the proposals contained in the planning White Paper 2007, *Planning for a Sustainable Future* and whether all of these projects should be considered by the infrastructure planning commission.

8.74 The Marine (Bill) White Paper published on 15 March set out a new regime for integrated management of the UK's seas which complements the proposals in the planning White Paper 2007, *Planning for a Sustainable Future*. A new Marine Management Organisation would generally operate as the consenting body for smaller projects in the marine area. The infrastructure planning commission would be responsible for decision on proposed offshore renewable energy developments over a threshold of 100MW. Both bodies will take decisions within the framework of the marine policy statement and relevant national policy statements.

Transitional arrangements

8.75 The energy planning system is complex, with a number of different consenting regimes, which have evolved over time and are not all tailored to the energy sector as it now stands³¹². Simply transferring the current suite of development consent regimes to the infrastructure planning commission unchanged would be problematic. It would mean the process would remain complex and time consuming, potentially limiting the efficiency improvements that the new system could deliver. Therefore, the Government proposes to rationalise the different development consent regimes and create, as far as possible, a unified, single consent regime with a harmonised set of requirements and procedures.

8.76 Finally, the Government believes that the move to a reformed planning system will require careful management of transitional arrangements to ensure that interested parties, including investors, understand the framework within which they are operating at any given moment and retain confidence both in the current system and the emerging new system. It is critical to energy security of supply that investment is not undermined or delayed at a time when the UK needs significant amounts of new energy infrastructure.

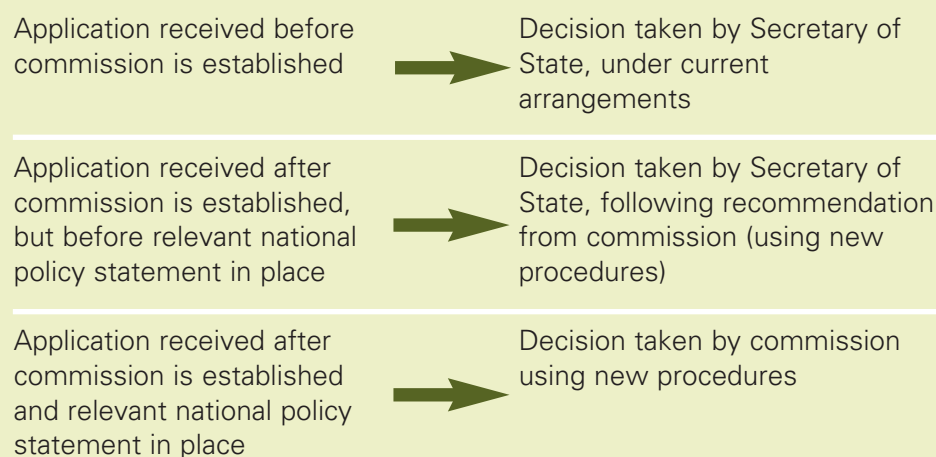
8.77 Establishing the infrastructure planning commission will need primary legislation which we will propose to at the earliest opportunity. The need for legislation means that the commission is unlikely to be in place before April 2009. Nationally significant infrastructure applications received before the

312 An overview of the energy planning system is available in The Energy Challenge, HMG Cmd 6887, July 2006, Table 7.1, Pages 138-141



commission is established would be decided by the relevant Secretary of State. Decisions on these applications would not be transferred to the commission. We expect to put national policy statements for infrastructure sectors in place before any applications in a sector are submitted to the infrastructure planning commission. However if applications come forward before the relevant national policy statement is in place the commission would consider the application using the procedures proposed in this white paper but would make a recommendation to Ministers for decision.

BOX: 8.2 TRANSITIONAL ARRANGEMENTS FOR PLANNING DECISIONS ON NATIONALLY SIGNIFICANT INFRASTRUCTURE



Improving Town and Country Planning for the national level

8.78 The Town and Country Planning system is “plan-led”. Broadly speaking, this means that the planning authorities prepare a development framework and spatial plans that help determine what can be built and where. There are two levels of plans. The Regional Spatial Strategy is the top tier of the development plan. It is drawn up by the regional planning body and provides a broad development strategy for a 15-20 year period (in London, the Mayor prepares a Spatial Development Strategy). It looks at a range of regional issues such as transport and housing and the potential impact of such developments. The second level of plan is the Local Development Framework, which is prepared by every local planning authority. They comprise a series of documents that outline the spatial strategy for the area, core policies and a monitoring and implementation framework. It is supplemented by various documents such as site specific allocations and a design guide and must also contain a statement of community involvement³¹³.

8.79 In considering applications under the Town and Country Planning system, decision makers (primarily local authorities) will consider if the

³¹³ More information about the planning system in the UK is available at www.planningportal.gov.uk and <http://www.communities.gov.uk/index.asp?id=1143104>

proposal is in line with the relevant regional and local plans and any other material considerations. National planning policy is set out in Planning Policy Statements (PPS). PPSs are prepared by the government after public consultation to explain statutory provisions and provide guidance to local authorities and others on planning policy and the operation of the planning system.

8.80 The Government has already carried out significant reforms of town and country planning. These have improved the effectiveness of plan making and development control, but we recognise that there is scope to make further improvements to the Town and Country Planning system. This is of particular relevance to the energy sector, given that planning decisions for energy infrastructure are taken both at a national level and by local authorities.

8.81 The Government therefore proposes to:

- Simplify the national planning policy framework, clearly stating policy requirements and separating these from supporting guidance and best practice;
- strengthen the role of local planning authorities in shaping their communities; and
- streamline the system as a whole to make it more accessible for all who need to use it.

8.82 The specific context for smaller renewable and low carbon energy developments will also be strengthened through the draft climate change PPS, once finalised (see earlier in this chapter).

8.83 The planning White Paper 2007, *Planning for a Sustainable Future*, also considers how local planning authorities can be supported to ensure that the local planning decisions on smaller renewable energy projects are made effectively and help to deliver national policy. As set out in that White Paper:

- Regional and local development plans would be expected to have regard to proposed national policy statements on infrastructure;
- the Government will work with local authorities and with the industry to: ensure that high quality renewable energy schemes are prepared; resolve potential local impact problems; and improve the engagement with local communities on the case for renewable energy;
- the Government will provide additional training for planning inspectors on the policy context for determining appeals on renewable energy schemes, including the need to deal with such cases promptly; and
- Ministers would have the power to direct that smaller projects which are below the normal thresholds but are nevertheless of national significance, or which have potential cumulative impacts with other applications above the thresholds, should be treated as nationally significant infrastructure projects and determined by the infrastructure planning commission.

8.84 The Government is also consulting on proposals to encourage inspectors to award costs where appeals have been required on unreasonable grounds.



8.85 The Government is also looking at ways to reduce the burdens on the planning system by removing the need for planning permission for certain developments within defined parameters. For example, the Government proposes that broadly all forms of householder micro generation equipment, should be permitted, subject to safeguards to minimise the impact on others, without the need to apply for planning permission. These proposals have been set out in a consultation paper³¹⁴. The Government is also proposing to extend permitted development rights on micro generation to other types of land use including commercial and agricultural development. Given the wide variety of types of non-residential use, we will take a staged approach, with consultation on detailed proposals for some types of non-residential building later this year.

8.86 As well as removing the need for planning permission in certain cases, the Government is looking at ways to better resource the planning system overall. For example, it proposes to consult on allowing the Planning Inspectorate to charge for planning appeals. The Government is also considering undertaking a pilot study with a small group of local planning authorities who would be able to offer a premium service to applicants. This approach would, for example, allow a local planning authority to charge an enhanced fee for a planning application where it guaranteed that the applicant would receive a decision in less than 13 weeks for major applications (8 weeks for minor or other applications).

Planning Summary of Measures

We have:

- **taken forward the suite of reforms as highlighted in The Energy Challenge in 2006, these have:**
 - **provided clarity on Government policy on the strategic need for energy infrastructure. We have achieved this through:**
 - consulting on a new Planning Policy Statement on Climate Change, which will be finalised later in 2007;
 - publishing a Statement of Need for Renewable Generation;
 - consulting on new guidance for developers on the Electricity Act consenting regime;
 - publishing updated guidance for developers on Combined Heat and Power projects; and
 - consulting on proposals to allow minor upgrades to existing overhead electricity networks without requiring the full consents process.
 - **created more efficient procedures for planning inquiries.**
We have achieved this by updating the inquiry procedure for projects considered under the Electricity Act consenting regime. The regulations came into force in April 2007.
 - **provided for shorter and more predictable timescales.**
We have achieved this by giving a voluntary commitment to make decisions under the Electricity Act regime within 3 months of receipt of the inspector's recommendations.

314 <http://www.communities.gov.uk/index.asp?id=1508888>

We will:

- **Following the consultation on the planning White Paper 2007, Planning for a Sustainable Future, and subject to Parliamentary approval, establish a new development consent regime for nationally significant energy infrastructure. This new consenting regime would focus on:**
 - **ensuring that there is a clear policy framework for nationally significant infrastructure;**
 - **helping promoters improve the way that they prepare and consult on applications;**
 - **streamlining the procedures for infrastructure projects of national significance by rationalising the different consent regimes and improving the inquiry procedures for all of them;**
 - **clarifying the decision making process, and achieving a clear separation of policy and decision making, by creating an independent commission to take the decisions on nationally significant infrastructure cases within the framework of the relevant national policy statement; and**
 - **improving public participation across the entire process.**

Reducing costs, delays and uncertainties will help create the right market framework for the private sector to make the investments in new energy infrastructure necessary to maintain the security of our energy supplies, and help reduce carbon emissions. The changes that we propose will, at the same time, improve the accountability of the system, the transparency of decision-making and the ability of individuals and communities to participate effectively in the planning process.



CHAPTER 9

Devolved Administrations, English Regions and Local Authorities

9.1 Some matters which relate to energy policy in Scotland, Wales and Northern Ireland are the responsibility of the Devolved Administrations, and therefore decisions on these matters are made in the light of each administration's particular circumstances. For example:

- the Devolved Administrations each have their own programmes on fuel poverty;
- the Renewables Obligation is the UK government's main policy measure for supporting the development of renewable electricity generation in the UK. As well as the Renewables Obligation Order for England and Wales, separate Orders have been made for Scotland and Northern Ireland; and
- the Devolved Administrations have an important role to play in respect of energy efficiency.

9.2 Following the recent elections in Scotland, Wales and Northern Ireland, new administrations have been or will shortly be formed. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals in this White Paper which touch on devolved matters will be progressed in accordance with the principles set out in the Memorandum of Understanding. It is expected that the Devolved Administrations will want to consider in due course how to take forward their responsibilities that are relevant to energy policy.

9.3 The English regions and local authorities also have a range of powers to assist the delivery of energy policy and an important role to play through taking local level decisions and deploying resources within their communities. This chapter explains how they are playing this role.

English regions

9.4 The Energy White Paper ³¹⁵ set out the importance of the work of the English regions in the delivery of our energy policy goals. Since 2003, partnerships of Regional Development Agencies (RDAs), Regional Assemblies and Government Offices have all set regional energy priorities and taken forward innovative projects to deliver national energy policy.

9.5 The RDAs have an important role to play in tackling climate change and contributing to other energy policy goals, within the context of their regional economic strategies. RDAs are well placed to contribute by:

- maximising UK business opportunities that arise through sector and supply chain support, and promoting business energy and resource efficiency;
- supporting the deployment of essential energy infrastructure and skills at a local and regional level; and,
- supporting low carbon innovation, through support for research and demonstration of new and emerging energy technologies.

BOX 9.1 RDA DELIVERY

Since 2003, RDAs and the regional energy agencies they support, have worked with key regional partners to:

- commit £59 million to supporting the development, demonstration and commercialisation of new energy technologies;
- generate £52 million in income for UK companies by helping them to identify and exploit new supply chain opportunities for supporting energy sector companies;
- offer advice to 11,000 small businesses on energy efficiency; and
- support 220 new business and housing developments to set standards for energy efficiency and carbon emissions significantly above national building regulations.

9.6 The Government recognises that RDAs are the leading strategic economic and sustainable development body in the regions, and within this context will contribute to the Government's energy objectives. Working closely with the Government Offices and Regional Assemblies, RDAs will have the key role in taking forward the implementation of this White Paper at regional level.

9.7 As part of their role in delivering the priorities identified in this White Paper at a regional level, RDAs have committed to:

- set carbon reduction targets in their corporate plans; publish an estimate of the carbon they expect to save from their policies and programmes by 2010 and 2020; and update these estimates at least annually as they develop new programmes;



- set out, by December 2007, which energy technologies they intend to prioritise and support over the next 10 years. This will give a clear steer to companies and potential investors, and encourage partnership working between the RDAs and research and innovation organisations, including the new Energy Technologies Institute³¹⁶;
- identify energy supply chain opportunities and set out priorities for promotion and support (by December 2007);
- support small and medium-sized businesses on energy efficiency, piloting in 2007-08 a streamlined business resource efficiency advice service through Business Link (also co-ordinated through the Business Support Simplification Programme) which will include working with a range of business support providers including the Carbon Trust and other bodies through the Business Resource Efficiency and Waste Programme (BREW);
- work with Sector Skills Councils and Regional Skill Partnerships to develop programmes to support the development of key energy skills, including:
 - engineering, project management and heavy construction;
 - operation and maintenance;
 - key suppliers and service providers to the energy sector;
 - areas necessary to facilitate the move towards zero carbon development including sustainable construction, the installation of energy efficiency and microgeneration technologies, and the project management/legal skills necessary for the establishment of Energy Services Companies (ESCOs);
- ensure all regeneration projects (from December 2007) and other developments for which RDAs provide funding or land meet carbon emissions standards significantly in advance of those required by Building Regulations (e.g. at least 10 BRE Environmental Assessment Method (BREEAM) carbon credits). This includes commercial developments not covered by the Code for Sustainable Homes; and
- play a key role in advocacy for the development of critical energy infrastructure and provide support through monitoring and advice on strategic proposals.

9.8 With their detailed knowledge of existing and likely locations for new development in the regions, RDAs are ideally placed to identify opportunities to exploit the sustainable use of heat. They are key consultees in the revised guidance on CHP for developers considering proposals for new large-scale power stations under section 36 of the Electricity Act. New power station developers will be signposted to seek advice from RDAs on potential customers for heat when considering the viability of heat recovery in new power plants.

9.9 RDAs are also well placed to pilot focussed approaches to financing and managing the sustainable production and delivery of energy, for example, through local ESCOs.

9.10 Where appropriate, RDAs will develop Community Energy Solutions (CES) companies like those currently being piloted in the North East and Yorkshire and Humber. These develop and deliver projects that bring together gas network extensions, energy efficiency installations, advice on benefits and small-scale renewables in communities with a high incidence of fuel poverty.

316 DTI: *Energy Technologies Institute prospectus*, September 2006 <http://www.dti.gov.uk/files/file34010.pdf>

BOX 9.2 COMMUNITY ENERGY SOLUTIONS

- One NorthEast and Yorkshire Forward have worked with the DTI to develop a number of community-based projects to tackle fuel poverty. The projects are being delivered through a Community Interest Company (CIC), which enables CES to generate profits that are reinvested back into the programme.
- Using initial funding of £4 million plus private and public sector contributions, by 2009 CES will assist a minimum of 4,000 households in twenty communities through gas network extensions and the installation of renewables. As well as bringing fuel poverty, energy efficiency, regeneration and public health benefits, the programmes will provide local economic benefits by, for example, developing economically viable supply chains for renewables and generating training and employment opportunities.

Local Authorities in England

9.11 Local authorities have a growing role to play in helping to meet our energy policy goals by leading carbon emissions reduction in their communities. The Energy Saving Trust works with local authorities to develop and implement sustainable energy strategies, through dedicated specialist support and training, and a national web and telephone technical advice service.

9.12 The Carbon Reduction Commitment (CRC), as described in chapter 2, is a mandatory cap and trade emissions trading scheme for all UK organisations with annual electricity use in excess of 6,000MWh from mandatory half-hourly meters, therefore covering many large local authorities. The scheme will be an important enabling tool for the public sector to deliver its carbon reduction targets.

9.13 The Government is also working with England's core cities³¹⁷ (Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield) to develop a joint statement or declaration on climate change. This will build on the Nottingham Declaration³¹⁸, which has now been signed by 200 local authorities and commits them to develop plans with their partners and local communities to progressively address the causes and the impacts of climate change and achieve a significant reduction of greenhouse gas emissions from their own authority's operations.

9.14 The Local Government White Paper 2006³¹⁹ set out proposals for a new Local Government Performance Framework, which will strengthen this role to help meet the commitments made in the 2006 Climate Change Programme³²⁰. This framework will cover climate change, while the 2007 Comprehensive Spending Review will make decisions on national outcomes, indicators and national targets.

317 See <http://www.corecities.com>

318 See <http://www.est.org.uk/housingbuildings/localauthorities/NottinghamDeclaration>

319 DCLG: *Strong and prosperous communities: the Local Government White Paper*, Annex F on tackling climate change, October 2006 http://www.communities.gov.uk/pub/99/StrongandProsperousCommunitiestheLocalGovernmentWhitePaperVol2_id1504099.pdf

320 HM Government: *Climate change, The UK programme 2006*, March 2006 <http://www.defra.gov.uk/environment/climatechange/uk/ukccp/index.htm>



9.15 To help local authorities tackle climate change the seven 'sustainable energy' beacon authorities³²¹ have developed self assessment tools to help councils evaluate their own performance and provide guidance for improvement. Twenty-one councils took part in a pilot programme to test the format and adjustments will be made on the basis of the findings to the programme before it is launched nationally later this year.

9.16 Ministers announced on 20 March 2007 a new 'Tackling Climate Change' theme for the 9th round of the Beacon Scheme³²². The scheme disseminates best practice in service delivery by granting beacon status to local authorities that demonstrate excellence and innovation within a specific theme. The new climate change theme covers reducing greenhouse gas impacts and adapting to the impact of climate change. Local authorities can apply to achieve beacon status on this theme until 29 June 2007.

9.17 Chapter 3 sets out the role that local and regional government has to play in facilitating the development and uptake of distributed energy, through their knowledge of local opportunities, and their responsibilities for planning and regeneration.

Arrangements in London – a Climate Change Duty for the Greater London Authority (GLA)

9.18 As a large metropolitan area and a major energy consumer, London plays an active role in tackling climate change issues. The Government has introduced, in the new GLA Bill currently before Parliament, a duty on the Mayor of London and the Assembly to address climate change, including both mitigation and adaptation policies. This will ensure that the GLA continues to take action beyond the term of a particular Mayor or administration.

9.19 The Mayor will prepare a climate change mitigation and energy strategy that must take into account and assist with the implementation of national Government policies on energy and climate change mitigation. The strategy will contain the Mayor's proposals relating to minimising carbon dioxide emissions from surface transport and the use of energy more broadly; supporting technological innovation; and promoting the efficient production and use of energy. It will also contain information about fuel poverty in Greater London. In preparing the strategy, the Mayor must have regard both to guidance produced by the Secretary of State and to national policies on climate change mitigation, security of supply, competitive energy markets and fuel poverty.

Action taken by the GLA to address climate change mitigation and energy

9.20 The Mayor has developed a Climate Change Action Plan for London³²³. This plan focuses on how London can deliver the most significant carbon savings at lowest cost. The plan is centred on four programmes: Green Homes, Green Organisations, Green Energy and Green Transport, and also includes actions for the GLA family (GLA, TfL, Metropolitan Police Authority, the London Development Agency and the London Fire and Emergency Planning Authority).

321 See <http://www.idea.gov.uk/idk/core/page.do?pagelId=5747988>

322 See <http://beacons.idea.gov.uk/idk/core/page.do?pagelId=1>

323 Mayor of London, *Action today to protect tomorrow*, February 2007
<http://www.london.gov.uk/mayor/environment/climate-change/ccap/index.jsp>

9.21 The London Energy Partnership, set up by the Mayor to respond to the challenges of climate change, security of energy supply and fuel poverty, has recently published the following reports on its website³²⁴: *Towards zero carbon development – supportive information for boroughs*; *Making ESCOs work*; *Skills for a low carbon London*; and *London carbon scenarios to 2026*.

9.22 The Mayor launched the London Climate Change Agency (LCCA) in 2005 to action projects in areas with a strong bearing on climate change, especially energy, transport, waste and water. It has implemented renewable energy projects at the London Transport Museum, Palestra and City Hall, as well as setting-up a joint venture energy services company – London ESCO³²⁵. The LCCA and the London ESCO will deliver major combined cooling, heat and power (CCHP) projects across London, and implement both large and small scale renewable energy projects.

9.23 The London Hydrogen Partnership³²⁶ was launched in April 2002. The Partnership provides a platform for funding bids and the initiation of projects to create conditions where these technologies can thrive.

9.24 The GLA, LDA and Defra are funding the prototype phase of a Green Homes 'Concierge Service' for London. This will trial, in 40 London homes, the provision of auditing, commissioning and installation support for owner occupiers seeking to improve the energy efficiency and renewable energy generation of their homes.

DEVOLVED ADMINISTRATIONS, ENGLISH REGIONS AND LOCAL AUTHORITIES

SUMMARY OF MEASURES

Following the recent elections in Scotland, Wales and Northern Ireland, new administrations have been or will shortly be formed. It is expected that the Devolved Administrations will:

- **want to consider in due course how to take forward their responsibilities that are relevant to energy policy.**

The RDAs in England will:

- **continue to set regional energy priorities and take forward initiatives to support national energy policy, for example by committing to publish carbon saving projections from regional measures and prioritise support for energy technologies.**

Local authorities in England will:

- **have a strengthened role to play in tackling climate change through measures in the new Local Government Performance Framework; and be able to use the new self-assessment tools to evaluate their own performance and provide guidance for improvement on tackling climate change.**

The GLA will:

- **formulate both mitigation and adaptation policies to address climate change in London under requirements in the new GLA Bill; and prepare a climate change mitigation and energy strategy.**

324 See <http://www.lep.org.uk>

325 See <http://www.londonesco.co.uk>

326 See <http://www.lhp.org.uk>



CHAPTER 10

Impact of our Measures

This chapter sets out how our proposals contribute to progress against our long-term energy policy goals and explores the wider economic implications of reducing carbon emissions in the short and the long-term.

10.1 Together with the effect of the EU Emissions Trading Scheme, we estimate that our proposals will result in annual carbon savings of between 23-33 million tonnes of carbon (MtC) by 2020. This means that, if all our measures are fully implemented and achieve the upper end of the range of savings we have estimated, we shall be on track to achieve real progress by 2020 towards our goal of reducing carbon dioxide emissions by 60% by 2050.

10.2 Our policies improve the security and reliability of our energy supplies by reducing our dependence on imported energy, supporting the economic recovery of indigenous energy supplies and strengthening our competitive market framework.

10.3 Increases in global energy prices mean that fuel poverty in the UK remains a significant challenge. We estimate that the measures specifically designed to combat fuel poverty will reduce the number of UK households in fuel poverty by around 200,000 by 2010.

Progress towards our energy policy goals

Impact on carbon emissions

10.4 The Government has a goal to achieve a 60% reduction in carbon emissions by 2050, and to make real progress towards this target by 2020, defined as UK emissions falling to within a range of 110-120 million tonnes of carbon (MtC) by 2020³²⁷.

10.5 The draft Climate Change Bill creates a new legal framework for the UK achieving, through domestic and international action, at least a 60% reduction in carbon dioxide emissions by 2050, and a 26-32% reduction by 2020, against a 1990 baseline. The Government will be required to set five-year carbon budgets, placing binding limits on aggregate carbon dioxide emissions. There is provision in the draft Bill for the targets to be amended in light of significant developments in climate science or in international law or policy.

10.6 The measures in this White Paper build on existing policies introduced to tackle carbon emissions. The continuation of these policies is expected to deliver an annual saving of around 25MtC in 2020³²⁸.

³²⁷ This carbon goal was set out in the Energy White Paper 2003: Our Energy Future, Creating a Low Carbon Economy

³²⁸ Table D1, *Updated Energy and Carbon Emissions Projections, May 2007*.
www.dti.gov.uk/energy/whitepaper

10.7 Depending on the assumptions made about future fossil-fuel prices,³²⁹ and not taking into account any of the policies in this White Paper, carbon emissions in the UK are projected to be 149 to 151MtC in 2020, 3 to 5MtC higher than our central projections in the Energy Review Report published in July 2006³³⁰.

10.8 Table 10.1 and Figure 10.1 below describe the carbon impact in 2020 of the measures included in this White Paper, measures announced since publication of the Energy Review Report and the potential impact of future phases of the EU ETS. The estimates are presented as a range to reflect uncertainty about the timing and impact of the measures. Box 10.1 describes the abatement potential and cost effectiveness of some of these measures (and of technologies) in 2020.

10.9 Beyond Phase II (2008-2012) of the EU ETS, caps and hence the future carbon savings to be delivered through the scheme, will be decided in line with future national allocation plans. Table 10.1 therefore presents an illustrative projection for carbon savings from the EU ETS in 2020 based on the assumption that the cap on emissions applied to EU ETS sectors in the UK in 2020 is equal to that agreed for Phase II. On the basis of our latest baseline emissions projections, this would achieve annual carbon savings of 13.7MtC in 2020³³¹.

10.10 Policies introduced as part of this White Paper represent a commitment to deliver additional carbon savings beyond those to be achieved through the EU ETS. In setting future EU ETS caps, we will first take into account how these White Paper measures impact on projected emissions, to ensure a sufficient level of effort from the EU ETS is maintained. It is our view that the carbon constraint imposed by the EU ETS should tighten over time.

10.11 We estimate that, together with the impact of the EU ETS, our proposals will result in carbon savings of between 23MtC – 33MtC in 2020. This means that, if all our measures are fully implemented and achieve the upper end of the range of savings we estimate in Table 10.1, we shall be on track to achieve real progress by 2020 towards our goal of reducing carbon emissions by at least 60% by 2050 (Chart 10.1).

10.12 The target set out in the draft Climate Change Bill to reduce UK carbon emissions by 26-32% in 2020 on 1990 levels, corresponds to the “real progress” aim in the 2003 Energy White Paper of reducing carbon emissions to within 110-120MtC by 2020. The targets in the draft Climate Change Bill are expressed in terms of carbon dioxide. Expressed in these terms³³², a 26-32% reduction on 1990 levels is equivalent to reducing emissions to around 438-402 million tonnes of carbon dioxide (MtCO₂) in 2020. We estimate that the measures in Table 10.1 will reduce carbon dioxide emissions in 2020 by 86-121MtCO₂, so that UK carbon dioxide emissions will be 469-433MtCO₂ in 2020. If we take the upper end of the range of savings we have estimated, we would be on course to achieve emissions savings just within the range set out in the draft Climate Change Bill (i.e. achieving just over a 26% reduction on 1990 levels).

329 These assumptions are published alongside this White Paper, and reflect the uncertainty over the outturn of future prices in the modelling. They are consistent with the latest assumptions from the International Energy Agency and the US Energy Information Administration.

330 See Annex B, DTI Updated Energy and carbon Emissions Projections. Part of the reason for the increase in projected emissions is the additional new coal capacity projected by 2020 (up to 8GW), due to the improved relative price of coal under the revised fossil-fuel price assumptions.

331 See Annex B for further explanation of EU ETS savings and implications for projected UK emissions.

332 In future, the Government will work in units of carbon dioxide, in line with the draft Climate Change Bill. Figures in this document are quoted mainly in million tonnes of carbon for consistency with the Energy Review Report. To convert carbon (C) into carbon dioxide (CO₂) multiply carbon by (44/12).



TABLE 10.1: ESTIMATED CARBON IMPACT OF OUR MEASURES, AND MEASURES ANNOUNCED SINCE THE PUBLICATION OF THE ENERGY REVIEW REPORT.

	MtC abated in 2020		
Energy Efficiency			
Better Billing	0.0	–	0.2
Real Time Displays in Households	0.0	–	0.3
Energy Performance of Buildings Directive (EPBD) ¹	0.6	–	1.6
Zero Carbon Homes ²	1.1	–	1.2
More Energy Efficient Products ³	1.0	–	3.0
Continued obligation on energy suppliers to make carbon reductions in the household sector ⁴	3.0	–	4.0
Business Smart Metering ⁵	0.1	–	0.2
New measure for achieving carbon savings from large non-energy intensive organisations (Carbon Reduction Commitment (CRC)) ⁶	1.0		
Energy Supply			
Changes to Renewables Obligation ⁷	0.4	–	1.1
CCS demonstration project ⁸	0.3	–	1.0
Transport			
Successor to EU voluntary agreements on new car fuel efficiency ⁹	1.8	–	4.1
Renewable Transport Fuel Obligation ¹⁰	0.0	–	1.0
EU ETS and offsetting measures			
EU Emissions Trading Scheme ¹¹	13.7		
Aviation in EU ETS (domestic) ¹²	0.2	–	0.4
Carbon Neutral Government ¹³	0.2		
Total	23.4	–	33.0

NOTE: Savings expressed in terms of million tonnes of carbon (MtC) under central fossil fuel price assumptions and rounded to the nearest decimal point.

¹ Excluding 0.2MtC included in the baseline. EPBD also supports 0.5-0.7MtC of the savings from the continued obligation on energy suppliers to 2020, to make carbon reductions in the household sector.

² Savings as estimated in the *Building a Greener Future* Consultation. These savings include the savings of the “Carbon neutral developments” policy as shown in the Energy Review Report Table 8.1.

³ The range of carbon savings for products policy has been updated since the Energy Review Report as part of an annual process. This also includes a larger coverage of product groups and is net of overlaps with other policies.

⁴ The level of ambition from 2011 is committed to be equal to that under CERT, delivering 3-4MtC of savings in 2020.

⁵ This estimate excludes 0.1-0.2MtC accounted for within the EPBD and CRC estimate.

TABLE 10.1 CONTINUED

⁶ The Government is committed to achieving a 1.2MtC saving from this sector – this estimate excludes 0.2 MtC accounted for in the EPBD estimate.

⁷ This estimate assumes a range based on different technology assumptions – the low figure is based on high technology cost assumptions, and the high figure on low technology cost assumptions.

⁸ This is based on around 0.3 GW to 1.9 GW of demonstration plant(s) displacing equivalent gas fired generation without CCS.

⁹ Illustrative estimate reflecting annual improvements in new car fuel efficiency of 1.5%-3.6% p.a. Actual efficiency improvements will depend on the level of target set at EU level and application in the UK.

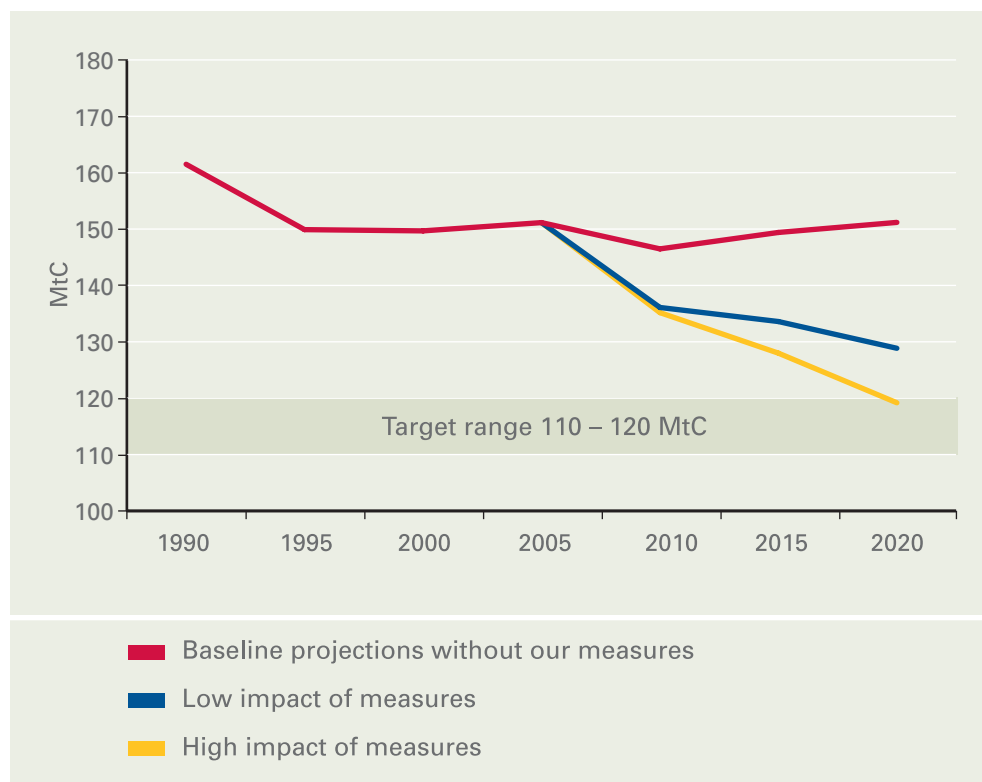
¹⁰ Illustrative estimate of additional carbon savings that would occur were we to extend the RTFO beyond 5%. Upper estimate assumes Obligation rising to 10% by 2015. Lower estimate reflects RTFO remaining at 5% from 2010. Carbon savings from a 5% RTFO are included in the baseline.

¹¹ This estimate reflects the assumption that the cap for Phase II of the scheme is unchanged in future phases. On the basis of our latest baseline projections, this would require 13.7MtC of savings in 2020. The actual level of savings to be achieved through EU ETS beyond Phase II (2008-2012) will be decided in line with future national allocation plans.

¹² Illustrative saving from UK domestic aviation, assuming a cap at 2005 emissions on projected 2020 levels, in line with the current Commission proposal. Carbon savings from international aviation have not been estimated in the absence of agreement on how to allocate emissions.

¹³ Savings from central government office estate, whose emissions constitute around one quarter of the total from the wider central government estate.

FIGURE 10.1. PROJECTED UK CARBON EMISSIONS AND CARBON IMPACT OF OUR MEASURES[#]



Source: DTI Energy Model, Updated Energy and Carbon Emissions Projections May 2007. See Annex B.

[#] UK carbon emissions, inclusive of carbon savings achieved through the EU ETS and other offsetting measures. High and low policy measure projections based on estimates presented in Table 10.1.



10.13 In accordance with the requirements set out in the draft Climate Change Bill, having set the five-year carbon budgets, it will be the duty of the Government to lay before Parliament a report, setting out the proposals and policies for meeting the budgets. As part of this process, the Government intends to keep under review options for additional measures that will further contribute to achieving our carbon goals.

10.14 For example, including road transport in the EU ETS could save in the region of 1-2MtC in 2020, depending on the cap on emissions set for the sector. This is on the basis of an illustrative assumption of a cap set to achieve emissions of between 2-5% below projected road transport emissions. As smart meters are rolled out to households, we might expect further carbon savings, as households act in response to the improved information and because improved metering would facilitate the transformation to an energy services market.

10.15 Furthermore, we are consulting on the issue of nuclear power. Following the consultation, should we conclude it is in the public interest for new nuclear power stations to be an option available to companies making investments in new generation capacity, it would be for the private sector to come forward with proposals should they choose to do so. One new nuclear plant could save up to 1.1MtC³³³.

10.16 The UK is set to deliver savings beyond those in its Kyoto target of a 12.5% reduction in greenhouse gas emissions by 2008-2012. Based on the latest projections UK greenhouse gas emissions are set to be around 23% lower than 1990 levels in 2010³³⁴. The EU has committed to cut total greenhouse gas emissions by 20% on 1990 levels by 2020, or by 30% if in conjunction with action by other countries. We estimate that the reduction in domestic carbon emissions from our White Paper measures (and inclusive of the estimated domestic abatement through the EU ETS) will result in UK greenhouse gas emissions of between 147-159 million tonnes of carbon equivalent (MtCe) in 2020, i.e. 25-31% lower than 1990 levels³³⁵.

10.17 By reducing emissions of harmful greenhouse gases such as Sulphur Dioxide (SO₂) and Oxides of Nitrogen (NO_x), as well as particulate matter (PM₁₀), our measures will also bring significant ancillary benefits, e.g. the benefits to public health associated with improved air quality. These are important to consider as the effects can be sizeable³³⁶. We estimate³³⁷ that, as a result of the additional measures in this White Paper and inclusive of domestic abatement through the EU ETS, the improvements in local air pollution and subsequent benefits in terms of public health could be between £500 million and £740 million in cumulative terms up to 2020, with the annual benefit in 2020 ranging between £80 million to £120 million³³⁸.

³³³ This assumes building of a new plant with a capacity of 1.6GW displacing an equivalent gas-fired plant.

³³⁴ Defra, Provisional 2006 UK Climate Change Sustainable Development Indicator. Savings are inclusive of expected UK effort through domestic and international action.

³³⁵ See Chart B1 in Annex B. This estimate is based on the latest DTI CO₂ emissions projections and Defra provisional non-CO₂ emissions projections (reference as above). The 25-31% range incorporates an estimate of UK domestic abatement through the EU ETS, but excludes UK effort achieved through international action.

³³⁶ The Stern Review finds that ancillary benefits could lower the overall cost of mitigation by 1% of GDP. In the IPCC 3rd assessment report, ancillary benefits were found to be in the order of 30-100% of abatement costs.

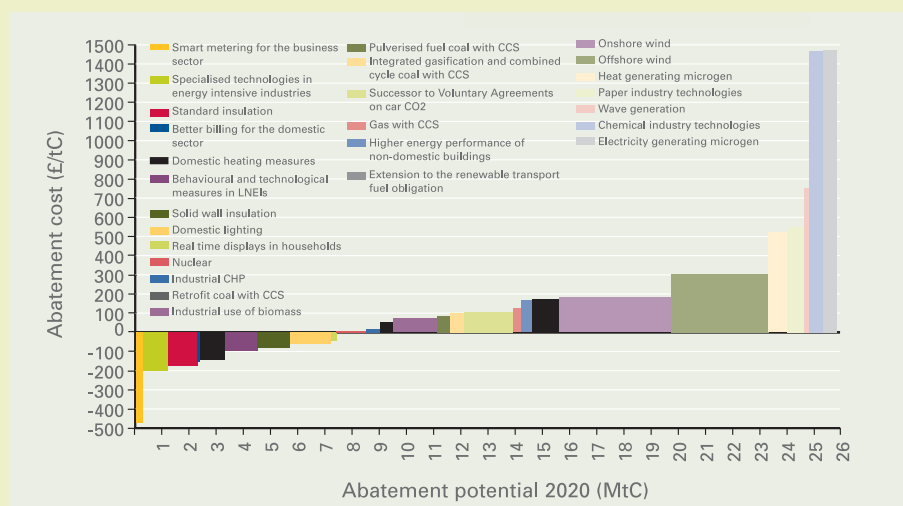
³³⁷ This analysis takes into account the reduction in energy demand and the ancillary benefits that accrue from this. It does not, however, take into account changes in the electricity generation mix.

³³⁸ 2007 Energy White Paper Cost-Benefit Analysis Synthesis www.dti.gov.uk/energy/whitepaper. Benefits are presented in £2005 prices, discounted in line with HM Treasury guidelines. These estimates are a first approximation and depend heavily on the final implementation approaches and "whole sector" emissions profiles. Air quality impacts will require further evaluation when detailed options are considered for each policy.

BOX 10.1. UK MARGINAL ABATEMENT CURVE.

A marginal abatement curve shows, for a given year, the incremental cost of reducing additional units of carbon, and shows where the most cost-effective abatement opportunities lie. The shape of the curve changes over time, and as part of this White Paper we have constructed a curve for the UK showing the domestic abatement potential of a range of measures and technologies in 2020.

FIGURE 10.2. MARGINAL ABATEMENT COST CURVE 2020



Under the central fossil fuel price assumptions published alongside this White Paper, each technology or policy option was compared against a counterfactual in order to calculate its carbon abatement potential – for example, in the case of electricity generation, the alternative source of generation was assumed to be a new combined cycle gas turbine (CCGT) station. For energy efficiency and transport options, assumptions were made about the fuel displaced and their associated emissions.

The curve should not be taken as a prediction of the exact volume of carbon abated from each technology or policy, since the precise impact of policies, and the timing of the entry and cost of a new technology, are both subject to some uncertainty. This is particularly true for emerging technologies, such as Carbon Capture and Storage (CCS), which is yet to be developed on a commercial scale. The potential for nuclear power by 2020 is only indicative and depends on whether the Government decides to allow private sector companies the option of investing in new nuclear power stations.

Some of the measures in Figure 10.2 abate carbon at negative cost by encouraging more efficient use of energy – for example, smart metering in the business sector. The aim of the policies in this White Paper is to create the conditions necessary for producers and consumers of energy to pursue the most cost-effective ways of lowering carbon emissions. Not all measures are cost-effective (i.e. achieve carbon savings at negative cost), particularly since the financial implications of carbon emissions for the environment and public health (i.e. the “social costs of carbon”) are not factored into this analysis. However, given the scale of the challenge we face, we must act to innovate a number of technologies and implement a wide range of measures if we are to meet our carbon goals.



Impact on security of supply

Efficient use of fossil-fuels

10.18 Using energy and therefore fossil fuels more efficiently is a cost-effective method of both tackling emissions and increasing energy security. By reducing our demand for gas and oil, we reduce our exposure to security of supply risks, including the risks associated with imported energy. While the interactions of producers and consumers in energy markets determines future levels of oil and gas demand, we can evaluate the impact of our policies in terms of our reduced demand for gas or increased UK gas production and therefore reduced need for gas imports³³⁹.

10.19 Our proposals can reduce gas consumption directly by reducing demand for gas i.e. in heating our homes; but also indirectly by reducing demand for electricity so reducing the need for new gas-fired power stations. We estimate that our measures will reduce electricity demand by between 8% to 15% of projected demand. In total, therefore, our measures could lead to up to 15 billion cubic metres of gas savings in 2020, equivalent to gas demand being 13% lower than it would otherwise be. This would reduce our projected gas imports by up to around 17%, which, combined with the possible increase in domestic gas production outlined in chapter 4, could bring our gas import dependence down to around 60% of projected gas demand in 2020, compared to around 80% if we did not implement our measures. Overall, we estimate that our measures will improve the energy efficiency of the UK economy by around 10% by 2020. This would be over and above the 25% improvement we already expect over that period.

Indigenous energy supplies

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

Strengthening the market framework

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

10.22 Providing incentives for low carbon generation, including through a carbon price, should also help our generation mix become more diverse. Our projections for the electricity generation mix, without taking account of the measures in this White Paper, show a trend towards higher levels of gas fired generation (see Annex B), which would reduce the diversity of our electricity

339 Here we assume a one-for-one relationship between reductions in gas demand, and reductions in gas imports.

generation mix. To encourage diversity whilst also tackling climate change we need to enable other cleaner technologies to play a role. In the short-term this means increasing renewables generation. Our changes to the Renewables Obligation, including the proposals to band the Obligation, are expected to increase the deployment of renewable generation up to 15% of electricity supplied and support a wider range of technologies. For the longer term, we are taking action: through continued support for renewable generation, through demonstration to promote the development of CCS power generation and, subject to consultation, deciding whether it is in the public interest for the private sector to have the option to invest in new nuclear power stations.

10.23 Beyond 2020 if CCS is successfully demonstrated, and if, following consultation, the Government decides it is in the public interest for new nuclear power stations to be an option for investment in new generation capacity, the share of gas fired plant in the mix is likely to be lower. By 2025, for example, if (in addition to the increased renewable generation delivered through the Renewables Obligation) we had 3 to 5 Giga Watt (GW) of coal-fired CCS plants, the share of gas in the mix could be between 6% to 10% lower³⁴⁰.

10.24 The EU recently agreed to a binding target of reducing its greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action and set a target for 20% of the EU's energy to be from renewable sources by 2020. The renewables target covers the energy we use in heat and transport as well as electricity. After a decision has been reached on each Member State's contribution to the EU agreement, we will bring forward the appropriate measures, beyond those set out in this White Paper, to make our contribution to meeting these targets, and in particular to increase the share of renewable electricity, heat and transport in our mix by 2020. In the meantime, the measures and market framework set out in this White Paper allow us to make significant progress on this important agenda.

Impact on competitive markets

10.25 According to a recent report, the UK has the most competitive energy market in the EU³⁴¹. Recognising our increased reliance on global energy markets, we are committed to a strong international agenda to promote more open and competitive markets overseas. We will work towards realising fully liberalised European markets by 2010 and work with the European Union to extend the application of market principles beyond its boundaries, as set out in chapter 1.

10.26 At home we are establishing a clear, stable framework for investment: by clarifying our position on the Renewables Obligation and carbon policy; improving the planning framework for large energy projects; and setting out a clear process for deciding on whether it is in the public interest that the private sector should have the option to invest in new nuclear power stations. We will improve energy market transparency by providing accurate, timely data through our new and improved market information arrangements. We therefore believe our proposals within this White Paper will help to maintain the UK's position as one of the most competitive energy markets in Europe.

³⁴⁰ This is based on CCS replacing equivalent existing gas-fired generation capacity.

³⁴¹ The Oxera report, *Energy market competition in the EU and G7: preliminary 2005 rankings*, shows that the UK leads the EU rankings in both electricity and gas markets <http://www.dti.gov.uk/files/file35324.pdf>



Impact on prices and fuel poverty

Impact on energy prices

10.27 Together with other countries, the UK has experienced increases in energy prices in recent years. Our existing policies to reduce carbon emissions are also having an impact on energy prices: the commitment to increase the share of renewable electricity under the Renewables Obligation by 15% by 2015, for example, is expected to increase electricity prices by around 5% by 2020, compared to what otherwise would have been. The existence of the EU ETS also affects UK electricity prices as electricity generators pass on the market value of carbon allowances. Assuming an EU ETS carbon price in 2020 of around €15-25t/CO₂, the impact on retail electricity prices could be between a 14-23% increase for industrial, and a 10-15% increase for household consumers, compared to if there were no carbon price ³⁴².

10.28 It is therefore important that the policies in this White Paper do not greatly add to energy prices. Individually our measures on the demand side are unlikely to have a large effect on consumer prices. We have analysed the full impact of our measures, including the impact on energy prices, on an individual basis. While some measures could contribute to increases in energy prices, our analysis shows that they will also help to reduce energy bills by targeting improved energy efficiency ³⁴³. For example, the cost of better billing, household real time displays and business smart metering will modestly increase energy prices, but will also lead to reduced energy bills if consumers act to realise energy efficiency savings. The continued obligation up to 2020 on energy suppliers to make carbon reductions in the household sector could increase household energy bills by approximately 1.5%-2% relative to today's energy bills, if all the costs are passed through to customers. But over time, we expect these costs will be outweighed by the benefits of a permanent reduction in energy demand.

10.29 Our proposals for changes to the Renewables Obligation, including banding, could add extra costs to final consumer bills. Based on our preferred banding regime described in chapter 5.3 the impact of the proposed changes to the Obligation could increase electricity prices by around 2% in 2020, compared to the existing regime.

10.30 Based on our analysis of individual measures, and given improvements in energy efficiency as a result of our proposals, we expect the overall impact on energy prices of our package of measures (excluding the EU ETS) to be equivalent of up to an additional 4% and 3% on the average annual household electricity and gas bill respectively in 2020 ³⁴⁴. Some of these costs will be offset by energy savings through improved efficiency. We place a strong emphasis on a market-based approach, so that we can achieve carbon savings in the most cost-effective way as possible.

342 DTI analysis based on the Defra RIA on Phase II EU ETS.

<http://www.defra.gov.uk/environment/climatechange/trading/eu/phase2/pdf/overarching-ria.pdf>.

343 2007 Energy White Paper Cost-Benefit Analysis Synthesis www.dti.gov.uk/energy/whitepaper

344 2007 Energy White Paper Cost-Benefit Analysis Synthesis. This is an illustrative figure based on the estimated impact of the policies when implemented on an individual basis. The final impact on prices of the proposals may be higher or lower than this, but this estimate does provide a broad indication of the expected impact.

Impact on fuel poverty

10.31 The Government has a target of eliminating fuel poverty in England by 2016, as far as reasonably practicable, with an interim target to eliminate it among vulnerable households by 2010. As described in chapter 2, we face challenges in meeting our fuel poverty targets, in part because of rising global energy prices. Recent rises in energy prices have resulted in an additional 1.2 million households in fuel poverty in the UK in 2006 compared to 2004, though price cuts taking effect during 2007 should reverse some of this increase.

10.32 Our projections (before the measures in this White Paper) of the number of households in fuel poverty between 1996 and 2016 are illustrated in Figure 2.1.1 in chapter 2, which shows that, under the central fuel price and income assumptions, 1.5 million households in England will be in fuel poverty in 2010. As incomes are assumed to rise faster than fuel prices, our projections show this number will fall to around 700,000 in 2016.

10.33 Specific measures in this White Paper have been designed to help reduce the number of households in fuel poverty. For example, a more joined up Government communication strategy to raise awareness of the support available, and more benefit entitlement checks to identify those eligible for the available support schemes. In total, we estimate that our proposals will lead to a reduction of around 200,000 UK households in fuel poverty by 2010.

10.34 It is possible that our package of measures may add to the challenges we face in combating fuel poverty, through their impact on energy prices. Our package of measures have been designed to improve the efficiency with which energy is used and, in some cases, will be specifically targeted at the fuel poor (for example, the priority group targeted under the Carbon Emission Reduction Target (CERT)). By encouraging the uptake of measures (such as domestic heat insulation for example), our proposals will not only reduce carbon emissions; but in doing so will also reduce consumer energy bills by reducing the amount of energy needed to heat households adequately.

10.35 We are midway through a full examination of our policies that tackle fuel poverty, looking at the ways in which they might be improved. We will set out our progress against our fuel poverty targets, and the next steps for our strategy, in the UK Fuel Poverty Strategy Fifth Annual Progress report, due to be published this summer.

Impact on the economy

10.36 The Stern Review highlighted the fact that climate change is a serious global threat that requires an urgent global response. It stated that the benefits of taking action far outweigh the economic costs of inaction. The dangers of unabated climate change will be equivalent to at least 5% of GDP each year and could possibly rise to 20% of GDP or more if a wider range of risks and impacts are taken into account. In contrast, the costs of action to avoid the worst impacts could be limited to around 1% of global GDP if the world pursues optimal policies.



10.37 Building on the Stern Review, which focuses on the global picture, we have used two models to explore the impact on the UK economy of reducing carbon emissions (see Box 10.2). The newly developed MARKAL-Macro model of the UK energy system is used to explore the potential long-term costs to the UK of achieving a 60% cut in domestic carbon emissions by 2050³⁴⁵. In addition, we have commissioned modelling work to explore the potential short to medium-term costs that might arise during the transition to a low carbon economy³⁴⁶.

Long-term impacts to 2050

10.38 We have used the UK MARKAL-Macro model (M-M) to analyse over the long-term the optimal combinations of technology options consistent with achieving our 2050 goal of a 60% reduction in carbon emissions at least cost (see Box.10.2). The UK MARKAL-Macro model is a purely domestic model, which, unlike our policy framework, does not allow for international carbon trading³⁴⁷.

10.39 Analysis using the UK M-M model suggests the annual cost of reducing UK carbon emissions by 60% by 2050 could be between 0.3% and 1.5% of UK GDP in 2050. The range reflects uncertainty over future fossil fuel prices and technological innovation – costs are higher when low carbon technologies do not develop as rapidly or efficiently as currently envisaged; conversely, higher fossil-fuel prices, or more enhanced development and take-up of energy efficiency reduce the cost of carbon abatement in the long-term.

10.40 The MARKAL modelling indicates that the costs of carbon abatement in the long-term could be significant, yet manageable. At the same time, they demonstrate that to achieve our carbon goals at least cost, a considerable change in our energy resources is required, including a concerted effort to reduce the amount of energy we use³⁴⁸.

10.41 As in the Stern Review, these cost estimates are dependent on a concerted level of effort by the international community to reduce carbon emissions, so that the UK benefits from global economies of scale in developing low carbon technologies. The modelling reflects a market in which the costs of technologies come down so that they are harnessed at their full efficient potential, and there are no barriers to their take-up. In reality, these developments are not guaranteed. The Stern Review highlights the role of Governments in developing low carbon technologies; for example, by ensuring a strong carbon price signal, and by supporting the research, development and demonstration of early stage technologies. The costs of achieving our carbon goal may be higher if the UK does not benefit from the lower technology costs associated with global efforts to reduce carbon

345 DTI *The UK MARKAL Model in the 2007 Energy White Paper* www.dti.gov.uk/energy/whitepaper; Strachan N., R. Kannan and S. Pye (2007), *Final Report on DTI-DEFRA Scenarios and Sensitivities using the UK MARKAL and MARKAL-Macro Energy System Models*, <http://www.ukerc.ac.uk/content/view/142/112>

346 Oxford Economics – *Report on Modelling the Macroeconomic Impacts of Achieving the UK's Carbon Emission Reduction Goal* www.dti.gov.uk/energy/whitepaper

347 Whilst this could imply that abatement costs could be cheaper than those estimated by the MARKAL- Macro model, the opportunities available in an international carbon market in 2050 are, at the moment, uncertain; and by then, the majority of cheaper abatement options abroad may have been exhausted.

348 The M-M model shows that substantial changes in behaviour – affecting the amount of energy we use and constraining economic activity – are necessary to deliver a 60% reduction in carbon emissions by 2050. Such substantial changes could imply reductions in the welfare of energy users, which are difficult to quantify (at least in financial terms) and are not captured in the cost estimates from the model.

emissions, or suffered adverse trade and competitiveness implications as a result of acting unilaterally³⁴⁹.

10.42 The long-term costs estimated by the M-M model are within the range indicated by Stern for global costs, and also within the range estimated for the 2003 Energy White Paper.

BOX 10.2. MODELLING THE IMPACT OF CARBON ABATEMENT

There are a number of models that can be used to estimate the impact of carbon abatement. The UK MARKAL-Macro model (M-M), developed from the earlier MARKAL model used as part of the 2003 Energy White Paper, is a “bottom up” technology model, covering the entire energy system. In the M-M model, a quantity constraint can be imposed on the level of carbon emissions to reflect government policy goals. The model then optimises available technological options to meet the target at least cost.

Since 2003, the M-M model has been developed to better calculate the macroeconomic impacts of carbon abatement, such as impacts on energy demand and GDP. The M-M model is particularly useful for exploring our energy system in the long-term, i.e. up to 2050, though it may be expected to produce lower-bound estimates of the costs of carbon abatement. This is because it is limited in its ability to capture the obstacles (such as information barriers) that, in reality, can slow the uptake of cost-effective abatement. Therefore, it does not capture the costs of implementing policies designed to overcome these obstacles. In addition, as a UK only model, it does not capture the potential trade or competitiveness impacts arising as a result of differences in climate change policy across countries.

Other models are more suitable for capturing the short-term dynamics of reducing carbon emissions. They explicitly model the short-run path as the UK makes the transition to a low carbon economy. When firms are forced to pay a price for each tonne of carbon they emit, they take time to move to a new “equilibrium” by reducing their demand for energy, or by using it more efficiently (through investment in new technologies, for example). Models that capture the short run dynamics do not necessarily have the technological detail of “bottom up” models such as the M-M model, and so do not fully capture the expected technological development as a result of carbon policy, which can help lower abatement costs. Therefore, to some extent, they will produce higher impact estimates.

We have commissioned Oxford Economics to explore the costs to the UK of carbon abatement in the short to medium-term. As part of the study for this White Paper, they have updated their model of the UK energy system to take better account of induced technological change as a result of climate change policy.

³⁴⁹ The M-M model is a UK-only model. Because it does not capture the effects of other countries’ actions, the cost estimates for UK imply a degree of coordinated action, which would mitigate any trade and competitiveness impacts. Furthermore, the cost and availability of technologies in the M-M model are dependent on the development, demonstration and deployment of technology that might be expected under global action.



Short to medium-term transition costs

10.43 By 2050, the economy will have had a long period of time to adjust to government policy to mitigate climate change, imposed, for example, through carbon emissions constraints and/or changes in energy prices. However, in the short to medium-term, i.e. between now and 2020, the economy might find it more difficult to adjust. Therefore, to supplement the MARKAL-Macro analysis, we have commissioned further modelling to explore the potential short to medium-term adjustment costs of reducing carbon emissions between now and 2020.

10.44 Under a hypothetical scenario, in which all UK sectors face a unilateral carbon price, sufficient to achieve a 30% reduction in UK domestic emissions by 2020, UK GDP in 2020 is reduced by 1.3-2%, depending on prevailing fossil fuel prices³⁵⁰. This is equivalent to the economy growing by 40-41% between now and 2020, compared with 43% if no further effort were made to reduce carbon emissions.

10.45 The short to medium-term macroeconomic impacts vary according to the approach and level of ambition. For example, imposing an immediate carbon price on all sectors to achieve early, dramatic reductions would be more costly than under a phased approach or one where the target was less ambitious. For example, we have compared the imposition of a carbon price of €60 t/CO₂ to achieve early, dramatic reductions with a more phased approach (where a carbon price is introduced at a relatively low level but increases gradually). In the former, the cumulative loss of GDP over the period could be twice as much³⁵¹. On the other hand the total cumulative reduction in carbon emissions over the period is higher than under a phased approach, i.e. 243MtC compared with 117MtC.

10.46 These scenarios reflect the UK acting unilaterally. However, the UK is actively pursuing a co-ordinated international effort in tackling climate change: commitments under the Kyoto Protocol, and the recent EU commitment to reduce EU greenhouse gas emissions by 20% by 2020 below 1990 levels, and by 30% as part of an international agreement, are encouraging. Looking ahead, our efforts to secure co-operation from large and fast growing economies such as the US, China and India will be of crucial importance in ensuring a truly global effort.

10.47 Acting unilaterally would mean the price of UK goods and services would increase, relative to those produced in other countries (because UK firms would incur a cost for the carbon emitted in their production and operation, whereas other countries would not). However, the modelling suggests that in the very short-term (i.e. up to five years), under a scenario of coordinated global action, the UK could also suffer a negative impact on the demand for its exports and therefore GDP, as other countries' economic output and demand for UK goods and services is depressed by similar policies affecting their energy use. But over the medium-term, UK competitiveness

³⁵⁰ "Business as usual" emissions in the short to medium-term analysis by 2020 are 17% below 1990 levels, therefore cost estimates reflect implications of reducing emissions by an additional 13% from the business as usual; and a 30% reduction on 1990 levels overall.

³⁵¹ 1.6% of GDP in 2020 compared to 0.8% under central fossil fuel price assumptions.

would be better maintained if there is multilateral action, as the UK's competitors would face the same penalty for carbon emissions associated with the production of goods and operation of services. If we act unilaterally, the analysis suggests our GDP will be lower by 1.7% in 2020 compared with no action; but acting to reduce emissions multilaterally reduces this impact to 1.3% of UK GDP in 2020³⁵².

10.48 International emissions trading reduces the overall global cost of abatement by allowing emissions reductions to take place where they are cheapest. Our policy framework allows for international action to reduce carbon emissions through the purchase of emissions credits, provided this is consistent with our international obligations. Through trading schemes such as the EU ETS or the Clean Development Mechanism, the UK could achieve significant carbon emissions reductions in a more cost-effective way and at a lower cost to GDP than if all emissions reductions were achieved domestically.

10.49 We have explored scenarios in which the UK achieves a 30% reduction in emissions by 2020, in part domestically but also through the purchase of international allowances. If we assume that the UK purchases two-thirds of the required level of abatement abroad, (at an allowance price equal to 80% of the cost of domestic abatement), achieving a 30% reduction in carbon emissions would cost 0.6% of GDP in 2020, compared with a GDP cost of 1.7% in 2020 if all reductions were achieved through domestic action³⁵³. Although there is uncertainty about the price and availability of emissions allowances in international markets, particularly after 2012, it is a useful illustration of how our market framework allows the UK economy to benefit from the most efficient, low cost abatement opportunities at home and abroad.

BOX 10.3. SECTORAL IMPACTS

The Stern Review recognised that if some countries move more quickly than others in implementing carbon reduction policies, some energy-intensive industries will locate in countries without such policies in place. A relatively small number of industries, particularly those which are most energy intensive, could suffer significant impacts as a consequence of pricing the cost of carbon emissions.

In the transition cost modelling we have conducted, output from sectors such as basic metals, paper, and wood and wood products have been highlighted to be particularly sensitive to achieving a significant reduction in carbon emissions by 2020.

However, the design of instruments to tackle climate change is of key importance and has the potential to mitigate some of the potential adverse effects in some sectors. For example, our analysis shows that if the UK invests in more cost-effective abatement options abroad through trading schemes such as the EU ETS and the Clean Development Mechanism, the effects on output are reduced by up to a half in basic metals and paper sector, and around a third in wood and wood products.

³⁵² Under central fossil fuel price assumptions.

³⁵³ Under central fossil fuel price assumptions.



10.50 The estimates of the short to medium-term costs should not be taken as analysis of the effects of the Energy White Paper measures, but rather an estimate of the macroeconomic costs of achieving our carbon goals. The measures in this White Paper are intended to harness the most cost-effective ways of making carbon savings (See Box 10.1).

10.51 By putting in place measures that create the conditions necessary for producers and consumers of energy to pursue the most efficient and least cost ways of reducing carbon emissions; and by encouraging multi lateral effort and allowing for international trading this White Paper could significantly improve the trade-off between carbon abatement and economic growth, and by doing so, should deliver carbon reductions at lower cost.

Implementation

Overview

We believe that the measures and proposals in this White Paper constitute a comprehensive, ambitious and integrated package which will make further progress towards our security of supply and our carbon reduction goals and bring about stronger international action.

11.1 The measures set out in this document aim to help maintain a stable domestic policy framework to give business and individuals the confidence to make decisions within that framework. However we need to be prepared to keep the impact of our policies under review to ensure they deliver the outcomes we are seeking. We will continue to do this and will, if necessary, further develop our policies to ensure we can achieve our goals over the long-term.

11.2 This chapter brings the White Paper's principal measures together and outlines how we intend to implement them. Some will require legislative change, and others will depend on the outcome of public consultations. The consultations being launched as a result of this White Paper are set out at Annex D. This also sets out a summary of the consultations announced in the Energy Review Report and since completed.

11.3 This chapter also outlines the key provisions in the draft Climate Change Bill published on 13 March 2007, which sets out a framework for moving the UK to a low carbon economy.

11.4 To give a comprehensive view of the progress made since the Energy Review Report, this chapter includes measures which have already been announced as well as those announced for the first time in this White Paper.

Principal measures in the Energy White Paper

International action

11.5 Maintaining security of energy supplies and avoiding dangerous climate change are the greatest challenges facing the international community. A successful global transition to a low carbon economy will require urgent and ambitious international action. The UK will take a lead in influencing the international community to respond to the challenge, working particularly closely with and through the European Union, to:

- promote open, competitive energy markets which provide fair access to energy supplies, foster investment and deliver secure supplies at competitive prices;
- put a value on carbon emissions to ensure that investment decisions fully reflect the costs of climate change;



- drive investment to accelerate the deployment of low carbon energy technologies; and
- promote policies to improve energy efficiency, to cut emissions and reduce our dependence on fossil fuels, consistent with economic growth.

Energy efficiency and saving energy

Energy metering and billing

11.6 We will ensure that real-time electricity display devices are available free of charge to consumers who request them between 2008–2010, and will ensure that all new and replacement electricity meters are fitted with a display. We will consult on these proposals in the context of our ambition to see a roll out of smart meters within 10 years.

11.7 We will consult on the implementation of a requirement for energy suppliers to roll out advanced and smart metering services to all but the smallest business users in Great Britain and those larger businesses not already subject to half hourly metering, advanced and smart metering services, within the next five years.

11.8 We will work with energy suppliers to ensure that household gas and electricity bills contain historic information on energy consumption.

Reduce emissions from buildings

11.9 We will make it a condition of Government funding that all new homes built by registered social landlords and other developers, and all new homes developed by English Partnerships will comply with Rating level 3 of the Code for Sustainable Homes. We will consult, by the end of this year, on whether all new homes should be required to have a rating against the Code.

11.10 We will roll out a requirement for all buildings that are sold to have an Energy Performance Certificate, to provide energy efficiency ratings.

11.11 We will announce our policy on the timetable for zero carbon housing later this year.

Raise product standards

11.12 We will publish, consult on and update annually our action plans setting out UK market analysis, standards, and indicative targets for more energy efficient products and services. Our consultation on the first of these, for consumer electronics, is published alongside this White Paper together with our programme for delivering further plans.

11.13 We will seek firm commitments from businesses in the supply chain to phase out the least efficient products and to help achieve our published targets, and will work to be the first European Member State to phase out the domestic use of the least efficient lightbulbs.

Improve incentives for energy suppliers to reduce emissions

11.14 We will double the energy efficiency target for the Carbon Emissions Reduction Target (CERT) (previously known as phase 3 of the Energy Efficiency Commitment) due to start in 2008, and hold a statutory consultation on the detail of the proposals in May 2007.

11.15 We will launch a Call for Evidence this summer to consider alternative designs for the post 2011 phase of the continuing obligation on energy suppliers.

Improve incentives for the business and public sectors to reduce emissions

11.16 We will introduce a cap and trade scheme, the Carbon Reduction Commitment (CRC), in the non-energy intensive business and public sectors whose metered electricity consumption is greater than 6,000MWh/yr. The CRC will target carbon dioxide emissions from both direct and indirect energy use. We will shortly issue a consultation on the detailed design of the scheme.

Public sector leadership

11.17 By spring 2008 we will publish guidelines setting out how energy savings can be made in public sector procurement, and work with manufacturers, retailers and service providers to help meet government targets.

Fuel poverty

11.18 To help identify vulnerable households who would benefit from information on tariff advice and energy efficiency measures, we will share benefits data between key partners responsible for tackling fuel poverty in clearly specified and controlled circumstances (if necessary, legislating to achieve this). We will work with energy supply companies to investigate the scope for voluntary initiatives on social tariffs, and will consider whether to take the opportunity for legislation to enable the Secretary of State to require companies to take action in this area.

Heat and Distributed Energy

11.19 We are taking further measures to assist the more widespread deployment of distributed electricity and heat generation. These are:

- a more flexible market and licensing arrangements, to be in place by end-2008;
- greater clarity on the terms offered by suppliers for microgenerators' exports of electricity to the grid;
- improved information and advice on distributed energy; and
- action to ensure more efficient and speedy connections for distributed generators.

11.20 We will develop further options to reduce the carbon impact of heat.



Oil, Gas and Coal

11.21 We will work with industry to maximise the economic recovery of the UK's oil and gas reserves, including assessment of the potential for establishing infrastructure West of Shetland, and by maintaining a stable and appropriate fiscal regime to attract investment.

11.22 We will introduce, in autumn 2007, a new security of supply information and analysis service helping to provide the information about supply and demand trends that market participants need to take decisions, including on new investments.

11.23 We propose to legislate to modernise the regulatory framework so that we have a fit for purpose licensing regime for offshore gas storage and unloading of Liquefied Natural Gas (LNG).

11.24 We will improve emergency planning arrangements to increase the UK's resilience in the extremely unlikely event of a gas emergency. We have already consulted on gas priority user arrangements and will be publishing a report on our consultation, including proposed changes, this summer.

Electricity Generation

Renewables

Strengthen the delivery of the Renewables Obligation (RO)

11.25 This White Paper confirms our intention to strengthen the RO, increasing the Obligation to up to 20% as and when increasing amounts of renewables are deployed.

11.26 We will introduce a banded RO, increasing support for technologies which are further from being competitive in the market, such as offshore wind, biomass CHP, wave and tidal stream, and decreasing levels of support to those technologies which need less, such as co-firing and landfill gas.

Improve the planning and consenting process for on and offshore renewables

11.27 The planning section later in this chapter sets out our proposals for improving the planning arrangements for all energy infrastructure, including onshore renewables. In addition to these, the Government is working on strategic assessments to underpin future development rounds for offshore wind.

Improve renewables grid connection on and offshore

11.28 We will work with NGET, Ofgem and industry to improve the management of the grid queue to help bring forward connection opportunities for the most viable renewables projects. In addition, Ofgem and the DTI supported by NGET, the other transmission licensees and industry, will review the technical, commercial and regulatory framework for the delivery of new transmission infrastructure and the management of the grid to ensure they remain fit for purpose as the proportion of renewables generation on the system grows. This will include, amongst other things, consideration of the

ways in which access to the network can best be shared between different forms of generation, and clarification of transmission access rights.

11.29 By the end of 2008, we intend to complete the development of an enduring regulatory framework for the grid connection of offshore renewable generation, which will enable timely and cost efficient connections to the onshore grid.

Move towards commercial scale carbon, capture and storage (CCS)

11.30 In the Budget 2007, we announced that we will launch a competition to develop commercial scale demonstration of CCS in the UK, which will be operational early in the next decade. When operational, this will make the UK a world leader in this globally important technology.

11.31 The UK CCS Regulatory Task Force has made good progress in preparing the regulatory environment for the whole CCS chain. We will be consulting on the conclusions of this work and on the options in the UK for regulation of the full chain of CCS technologies later this year.

11.32 We will pursue full recognition of CCS in Phase II of the EU ETS.

Nuclear power

11.33 Alongside this White Paper, we are publishing a consultation document which brings together the evidence and information we have considered in reaching our preliminary view that it is in the public interest to allow the private sector the option of investing in new nuclear power stations. This consultation takes account of the ruling of the High Court in February 2007 and the Government's commitment in 2003 to the fullest public consultation and the publication of a further White Paper setting out confirmed proposals for new nuclear power stations.

11.34 Alongside the nuclear consultation, there is a linked technical consultation on the details of running a Justification process and a Strategic Siting Assessment.

11.35 As part of the Managing Radioactive Waste Safely (MRWS) Programme, the Government expects to launch a consultation in June 2007 to consider the proposed implementation framework for the geological disposal of the UK's higher activity radioactive waste, including the approach to site selection.

11.36 Respondents to the nuclear consultation may wish to consider the information brought forward in these consultations.

Research and Development, Demonstration and Deployment and Skills

11.37 We will create a step-change in UK R&D funding through the new public/private sector Energy Technologies Institute (ETI). The combined Government/private sector funding contribution gives the ETI a budget of a minimum of around £600 million over a lifetime of a minimum of 10 years.



Additional private sector partners are being identified to match the Government's commitment of up to £550m over the next decade. We are asking the Sector Skills Councils to report on the skill gaps in the energy sector and the action being taken to address them.

Transport

11.38 We will work with the European Commission and other international partners on road transport emissions, and ensure the European Union gives serious consideration to including surface transport in the EU Emissions Trading Scheme (EU ETS). We will also pursue the inclusion of aviation in emissions trading schemes in Europe and internationally.

11.39 We will continue to work with the European Commission, other Member States and all interested parties in the development of the case for demanding mandatory new car fuel efficiency targets.

11.40 We will deliver annual savings of around 1 million tonnes of carbon by 2010 through the Renewable Transport Fuel Obligation, and consider future levels of the obligation in the light of responses to the current consultation on the draft Order and the future design of the obligation³⁵⁴.

11.41 We will support the development of new low carbon technologies. The new Low Carbon Transport Innovation Strategy³⁵⁵ (LCTIS) sets out a wide range of actions the Government is taking to encourage innovation and technology development in lower carbon transport technologies. The Strategy will be delivered in partnership with the Technology Strategy Board and the Energy Technologies Institute.

Planning

11.42 We are delivering on the planning proposals set out in the Energy Review Report to provide clarity on the Government's policy on the strategic need for energy infrastructure; to create more efficient procedures for planning inquiries; and provide shorter and more predictable timescales.

11.43 The Government is also consulting on proposals to reform the planning system for nationally significant infrastructure projects, including energy, as set out in the planning White Paper, *Planning for a Sustainable Future*, published on 21 May 2007³⁵⁶. Following this consultation and subject to Parliamentary approval, the Government will establish a new development consents regime for such projects. This new regime would focus on:

- ensuring that there is a clear policy framework for nationally significant infrastructure;
- helping promoters improve the way that they prepare and consult on applications;
- streamlining the procedures for infrastructure projects of national significance by rationalising the different consent regimes, and improving

354 <http://www.dft.gov.uk/consultations/open/drafttrfo/?view=Standard>

355 The strategy can be found at <http://www.dft.gov.uk/pgr/scienceresearch/technology/>

356 The Planning White Paper can be found at: <http://www.communities.gov.uk/planningwhitepaper>

- the inquiry procedures for all of them;
- clarifying the decision making process, and achieving a clear separation of policy and decision making by creating an independent commission to take the decisions on nationally significant infrastructure cases within the framework of the relevant national policy statement; and
- improving public participation across the entire process.

Devolved Administrations, the English Regions and Local Authorities

11.44 Some matters which relate to energy policy in Scotland, Wales and Northern Ireland and are the responsibility of the Devolved Administrations, and therefore decisions on those matters are made in the light of each administration's particular circumstances. It is expected that the Devolved Administrations will want to consider in due course how to take forward their responsibilities that are relevant to energy policy.

11.45 Regional Development Agencies (RDAs) in England will continue to set regional energy priorities and take forward initiatives to support national energy policy.

11.46 Local Authorities in England will have a strengthened role to play in tackling climate change through measures in the new Local Government Performance Framework; and will be able to use the new self-assessment tools to evaluate their own performance and provide guidance for improvement on tackling climate change.

11.47 The Greater London Authority will formulate both mitigation and adaptation policies to address climate change in London, under requirements in the new GLA Bill, and develop a climate change mitigation and energy strategy.

Energy legislation

11.48 Some measures announced in this White Paper will require legislation, although in some cases this will depend on the outcome of public consultations. We propose to take forward work in this area as soon as is feasible.

Climate change legislation

11.49 On 13 March 2007 the Government published draft legislative provisions on climate change for consultation and pre-legislative scrutiny³⁵⁷. This legislation would create the institutional and legal framework for carbon reductions and make specific, quantified commitments that will complement the policy objectives in this White Paper. Its main focus is on how we can make the transition to being a low carbon economy. In summary the draft Bill:

- creates a new legal framework for the UK achieving, through domestic and



international action, at least a 60% reduction in carbon dioxide emissions by 2050, and a 26-32% reduction by 2020, against a 1990 baseline. The Government will be required to set five-year carbon budgets, placing binding limits on aggregate carbon dioxide emissions. There is provision in the draft Bill for the targets to be amended in light of significant developments in climate science or in international law or policy.

- the carbon budgets will cap emissions over five-year periods, with three budgets set ahead to help businesses plan and invest with increased confidence;
- creates a new independent body, the Committee on Climate Change, to advise on the setting of carbon budgets and to report on progress;
- contains enabling powers to make future policies to control emissions quicker and easier to introduce; and
- provides a clear accountability framework, in particular relation to the Government's reporting to Parliament on mitigation and adaptation.

11.50 The Committee on Climate Change will make recommendations to the Government on the level of the five year carbon budgets based on rigorous scientific and economic analysis. The Government wants to establish an economically credible emissions reduction pathway to 2050, and provide clarity and certainty about the UK's aggregate contribution to cutting carbon emissions. The draft Climate Change Bill will set up a framework in which this can be done. The draft Bill will give additional powers to create or extend carbon trading schemes, providing Government with another tool to ensure these budgets are met.

Better Regulation

11.51 The Government is clear in its determination to achieve its energy policy objectives through an approach that is consistent with the principles of better regulation.

11.52 We recognise that between now and 2020 there will be costs in achieving our energy goals as the economy takes time to adjust. Even the most cost-effective measures pose some short-term one-off costs for business, including change in regulation, so called 'transitional costs'. The Government needs to enable businesses to make informed investment decisions in order to maximise benefits from these measures.

11.53 In keeping with our better regulation agenda, we are undertaking a review of major climate change instruments to ensure that the regulatory burden (administrative and compliance) on business is kept to a minimum. The review will primarily look at the EU Emissions Trading Scheme, Climate Change Agreements, and domestic trading mechanisms such as the proposed Carbon Reduction Commitment, but will also consider significant overlaps in administrative requirements between these three instruments and other policies that target emissions from business. We welcome the report by the Better Regulation Commission: *Regulating to Mitigate Climate Change*³⁵⁸ and will shortly publish our response.

³⁵⁸ http://www.brc.gov.uk/downloads/07/climate_change.pdf

11.54 We will continue to analyse the impacts, costs and benefits, of regulation including transitional costs, and provide this information in impact assessments for new policy. As part of individual impact assessments, we will consider how we are going to implement, monitor and enforce these measures on a case-by-case basis while having regard to the collective regulatory impact on business and other parties.

Sustainable Development Strategy

11.55 The measures in this White Paper are also in line with the Sustainable Development Strategy published in 2005³⁵⁹. The Strategy takes account of developments since the last Strategy in 1999, both domestically and internationally, including the changed structure of government in the UK with devolution in Scotland, Wales and Northern Ireland. All UK Government Departments share responsibility for making sustainable development a reality.

11.56 For a policy to be sustainable it must: live within environmental limits; ensure a strong, healthy and just society; achieve a sustainable economy; use sound science responsibly; and promote good governance.



Fourth Annual Report on progress towards the 2003 Energy White Paper goals

Sustainable Energy Act 2003

The report is published in accordance with the Secretary of State's obligations under section 1 of the Sustainable Energy Act 2003. It describes progress made in the reporting period 24 February 2006 to 23 February 2007 towards: cutting the United Kingdom's carbon emissions; maintaining the reliability of the UK's energy supplies; promoting competitive energy markets in the UK; and reducing the number of people living in fuel poverty in the UK. The report is based on information available to the Secretary of State at the date of its completion.

The Annual Report fulfils a Parliamentary requirement to report on progress on the UK's energy goals during the set time period stated above and therefore the document does not include the measures/elements announced in the 2007 Budget or the decisions taken at the European Council in March 2007. Neither does it include the measures set out in the Energy White Paper to which this Report forms an annex. However, to help the reader we have included updates in footnotes on key issues.

1. The Last 12 Months: An Overview

1.1 The 2003 Energy White Paper set out our four goals¹:

- to put ourselves on a path to cut the UK's carbon dioxide emissions by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- to ensure that every home is adequately and affordably heated.

Action this year

1.2 The following are some of the main developments towards the four goals over the last 12 months to February 2007:

- the revised UK Climate Change Programme was published on 28 March 2006 and set out a package of new measures to take us towards our 2010 domestic carbon emissions target;
- we published the Energy Review Report *The Energy Challenge* in July 2006 detailing what needs to be done to stay on track to meeting the goals in the 2003 Energy White Paper;



- the Office of Climate Change (OCC) was established in October 2006. It is a shared resource across the Government established with the aim of ensuring that analysis and policy work is consistent and supports the overall climate change strategy;
- the Stern Review of the economics of climate change was published in October 2006 and confirmed that climate change is real and is a problem that can only be solved by collective international action. The Stern Review demonstrated that urgent action is needed to mitigate the effects of climate change and that the costs of global action to mitigate the most dangerous effects of climate change are significant but manageable, as long as action is taken multilaterally;
- the UK's National Allocation Plan (NAP) for the second phase of the EU Emissions Trading Scheme (2008 – 2012) was accepted without change by the European Commission in December 2006;
- in January 2007, the European Commission published its Strategic Energy Review outlining proposals for the development of the internal energy market in the European Union, including greater unbundling of energy network businesses from other activities, more effective regulation and greater transparency. We support these proposals, which we see as complementary and essential if the market is to develop further;
- market investment in new and enhanced UK gas infrastructure has continued with the completion of the Langeled and BBL pipelines allowing increased flows of Norwegian and Continental gas to the UK and easing the winter supply concerns; and
- investment continued in renewable energy sources to help meet our 2010 target of 10% of electricity coming from renewable sources of energy. The opening of the Braes of Doune wind farm in February 2007 took the UK's wind generation capacity above 2GW, making us one of only eight countries in the world to have reached this level. It took 14 years for the first 6W of wind capacity to become operational and only a further 20 months for the second GW.

2. Reducing Carbon Emissions

Commitment

To put ourselves on the path to cut the UK's carbon emissions by 60% by 2050, with real progress by 2020². The UK also remains committed to the Kyoto protocol commitment to reduce greenhouse gas emissions by 12.5% below 1990 levels by 2008-12.

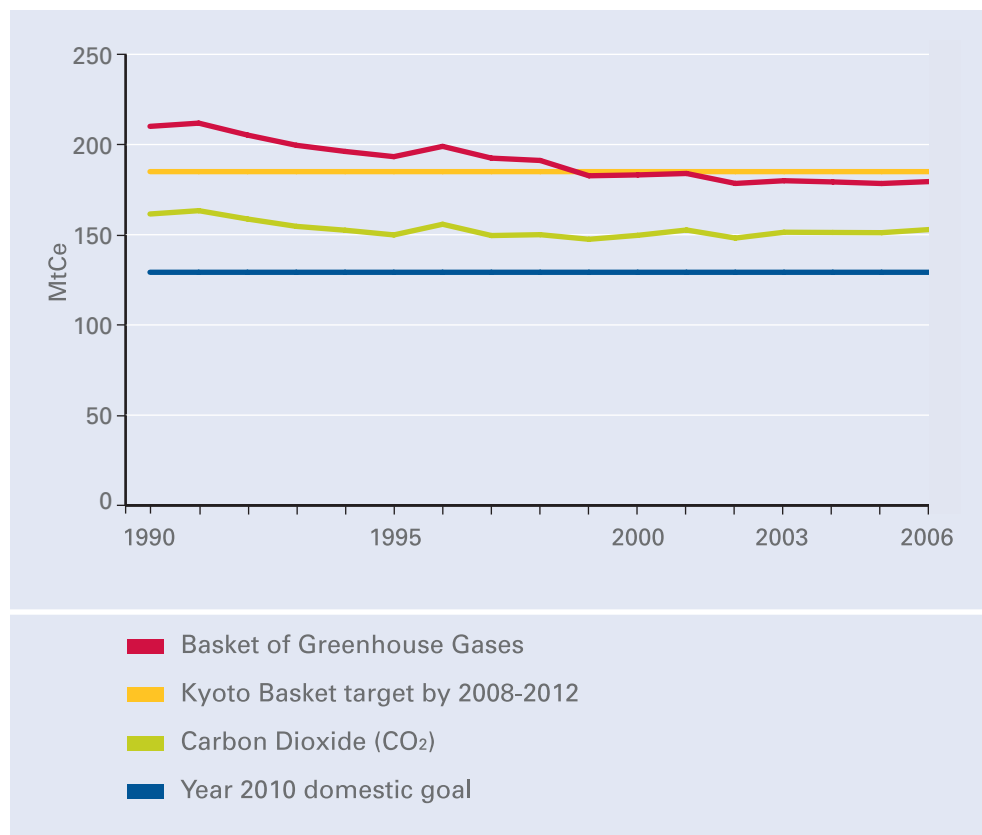
Progress to date

2.1 Latest estimates show that total UK **greenhouse gas emissions** in 2006 had fallen 15% below 1990 levels, while provisional estimates indicate that **carbon dioxide emissions** were 5% below 1990 levels in 2006.

² The draft Climate Change Bill creates a new legal framework for the UK achieving, through domestic and international action, at least a 60% reduction in carbon dioxide emissions by 2050, and 26-32% reduction by 2020, against a 1990 baseline.

Progress to date

FIGURE A1. GREENHOUSE GAS AND CARBON DIOXIDE EMISSIONS



2006 figures are DTI provisional estimates

Source: Department for Environment, Food and Rural Affairs

2.2 The revised UK Climate Change Programme was published on 28 March 2006 and set out a package of new measures to take us towards our domestic carbon emissions goals. The Climate Change and Sustainable Energy Act 2006 commits the Government to report annually to Parliament on progress to reduce greenhouse gas emissions and steps taken to reduce them. That report will be published shortly.

2.3 The Government's microgeneration strategy was published on 28 March 2006. The objective of the strategy is to create conditions under which microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, the community and small business. The strategy commits to tackling barriers currently preventing widespread take-up. Microgeneration could provide 30-40% of the UK's electricity needs by 2050 and help reduce household carbon emissions by 15% per annum. Measures to tackle upfront costs include the Low Carbon Buildings Programme, an £86 million capital grant programme. Phase 1 of the Programme was launched in April 2006.

2.4 The 2003 Energy White Paper set out the importance of the work of the English regions in the delivery of our energy policy goals. Partnerships of Regional Development Agencies (RDAs), Regional Assemblies, and the



Government Offices have been operating in all regions to set regional energy priorities, and to take forward innovative projects aimed at delivering national energy policy and to maximise benefits for local communities and business. Over the past twelve months, regional partnerships have taken forward the following innovations:

- the North East has supported the planning system in delivering improvements to energy efficiency and increased uptake of microrenewable technologies;
- West Midlands completed the second phase of a Sustainable Housing Action Plan;
- East Midlands launched an Affordable Warmth Strategy;
- the North West launched a Climate Change Action Plan;
- Yorkshire and Humber completed and launched a Regional Energy Infrastructure Action Plan;
- East of England looked at how to support the development of distributed networks for energy – including for offshore renewables;
- the South East set up the South East Sustainable Energy Partnership;
- the South West has committed £650,000 to the delivery of the South West Bioheat Programme; and
- London prepared and launched a Climate Change Action Plan.

2.5 Following on from the Energy Review Report, the Government established the Office of Climate Change (OCC) in October 2006. It is a shared resource, reporting to ministers across the Government and has a vital contribution to make to ensure that analysis and policy work is consistent. It also supports the Government's overall climate change strategy.

2.6 The Stern Review of the economics of climate change was published in October 2006 and confirmed that climate change is real and that it is a global problem that needs a multilateral solution. The main findings from the Review are:

- the impacts of climate change on growth and development could be much higher than previously thought;
- serious impacts will be felt around the world, including in developing countries least able to adapt;
- action is urgent – the earlier we start, the greater the chance we have of limiting the risks of dangerous climate change and the cheaper it will be;
- acting to reduce emissions and stabilise greenhouse gases at sustainable levels could cost around 1% of world GDP, not acting could cost at least 5% and up to 20%; and
- the costs of global action to mitigate the most dangerous effects of climate change are significant but manageable, as long as action is taken multilaterally, with flexibility to respond to new scientific and economic information.

The Stern Review highlighted the need for a carbon price signal across countries and sectors to ensure that emission reductions are delivered in the most cost-effective way.

2.7 The European Commission published the results of the first year of the EU Emissions Trading Scheme (ETS) from the Community Independent Transaction log in May 2006. The first year results showed that the infrastructure behind the scheme is sound and forms a solid base to build on

for the future. Compliance was excellent in the UK – almost all operators submitted their verified emissions reports and surrendered the correct allowances within the deadlines.

2.8 The UK submitted its Phase II National Allocation Plan (NAP) for the EU ETS to the European Commission by the December 2006 deadline. Since then the Commission has made its decisions on NAPs submitted by Member States, with the UK's NAP being accepted without change. The majority of Member States have seen their overall allocation reduced by the Commission in line with meeting their Kyoto commitments.

2.9 Following the release of the Stern Review, the Government published a Vision Statement on Emissions Trading which reiterated our commitment to building on the EU ETS as the main way to price carbon in the economy.³ The vision statement gives three areas that we would like to progress with our EU partners:

- setting safe, stable and affordable emissions limits;
- building a global carbon market; and
- improving the efficiency of the scheme.

2.10 The Mexico Ministerial in October 2006 focused on how the three strands of climate change mitigation (technology development and deployment; financing of climate change projects; and the overall economics of climate change), fit together and could be used to take forward the Gleneagles Dialogue's work on climate change. The overall message from the second ministerial was one of increasing urgency.

2.11 The next meeting of the Dialogue will be hosted in September 2007 by the German Government during their G8 Presidency. The Japanese Government also agreed to take forward the Dialogue in 2008, with a report to the G8 summit in the summer. Both the German G8 presidency in 2007 and the Japanese G8 presidency in 2008 will continue to have a strong focus on climate change and associated themes.

Increasing renewables

2.12 The Government has a target of 10% of electricity coming from renewable sources of energy by 2010, with an aspiration for this level to double by 2020. We have continued to work with interested parties to alleviate the barriers that are preventing industry from achieving this target. Recent action includes:

- with the opening of the Braes of Doune wind farm in February 2007, the UK became one of only eight countries in the world to achieve more than 2GW of wind generation. It took 14 years to reach 1GW and only a further 20 months to reach 2GW;
- between March 2006 and February 2007, DTI granted consent for:
 - a combined offshore windfarm and gas generating station – the Ormonde project. This innovative hybrid project will be sited around 10km from Walney Island (off the North West coast of England) and has the potential to generate a total of up to 200MW of electricity, with around half coming from the wind farm; and



- three Round 2 offshore wind projects with a total capacity of 1800MW. Of these, the London Array development has the potential to be the largest offshore wind farm in the world, supplying around 1% of the UK's electricity supply equivalent to 750,000 households.
- in April 2006 the Scottish Executive gave consent to the Whitelee wind farm project, with a capacity of 322MW and August 2006 saw the first of two 5MW offshore wind turbines installed in the Moray Firth – the furthest from shore and deepest in the water of its kind in the world. Scottish Executive has committed £3 million to the project;
- in June 2006, the 19MW Callagheen wind farm was opened in Co. Fermanagh bringing total large scale wind generation capacity in Northern Ireland to 106MW. In addition some 1,200MW are the subject of Planning Applications in Northern Ireland; and,
- the UK has seen planning approval in 37 small and large Renewable Obligation eligible projects with a total capacity of 2676MW, including 15MW landfill gas and 9MW biomass⁴.

Renewables policy

2.13 We have made a number of changes to the Renewables Obligation (RO) to improve its effectiveness following the 2005 RO Review. Further changes to the RO were proposed in the 2006 Energy Review Report⁵ which set out our ideas on strengthening the performance of the RO. One of the principal changes proposed was to adapt the RO to provide greater support to emerging technologies and less support for established technologies. The Government's preferred option for achieving this was through a "banding" system. DTI published a consultation document – Reform of the Renewables Obligation and Statutory Consultation on the Renewables Obligation Order 2007⁶ – in October 2006 seeking views from the renewables sector on the above proposals⁷. The consultation proposed a number of administrative changes, in particular, proposals to make it easier for microgenerators to access the benefits of the RO.

2.14 The Energy Review Report stated that the Government was committed to introducing fundamental change to the planning system for major energy projects, this will include large onshore wind projects. In December 2006, in his Pre-Budget Report, the Chancellor welcomed the Eddington and Barker reviews which both made recommendations for the UK planning system. These recommendations on planning for infrastructure can play a significant role in ensuring the UK's competitiveness and delivering our objectives on climate change, the environment and energy security.⁸

4 Planning, Monitoring & Review of Renewable Energy Projects, Project Status: www.restats.org.uk

5 <http://www.dti.gov.uk/energy/review/page31995.html>

6 <http://www.dti.gov.uk/consultations/page34162.html>

7 The Government conclusions to this consultation can be found at: <http://www.dti.gov.uk/energy/whitepaper>

8 The Planning White Paper: *Planning for a Sustainable Future*, published in May 2007, sets out proposals in planning reform.

2.15 The Scottish Executive consulted during 2006 on the creation of a Marine Supply Obligation (MSO) under the Renewables Obligation (Scotland). This will require suppliers, as part of their renewables obligation in Scotland, to supply a specific proportion of their electricity sales from wave and tidal generation located in Scottish waters. The buy-out price which suppliers would pay in respect of any shortfall against their MSO would be at a considerably higher level than the standard buy-out price, to reflect the higher costs of generating power from wave and tidal devices.⁹ However, the level of the MSO will remain at zero until there is generation from these technologies which allows suppliers to meet it. Reviews of the MSO level will take place each year (on the basis of transparent and published criteria), and the legislation amended accordingly.

2.16 Under the Clean Energy Programme, announced in May 2006, the Scottish Executive committed £25 million over two years for the development of wave and tidal energy, biomass, and hydrogen and fuel cells (as well as additional funding for small-scale renewables).

2.17 In February 2006, the Environment and Renewable Energy Fund (EREF) was launched providing an additional ring-fenced amount of £59.2 million over two years to enhance and accelerate renewable energy development in Northern Ireland. The EREF, which confirms the Government's commitment to reducing Northern Ireland's high dependence on imported fossil-fuels, focuses on four broad areas:

- research and demonstration (£15.2 million);
- accelerated deployment (£35 million);
- building market capacity (£2.5 million); and
- underpinning knowledge and raising awareness (£6.5 million).

3. Energy Reliability

Commitment

Our goal is that people and business can rely on secure supplies of energy – gas, transport fuel and electricity – at affordable prices delivered through competitive markets, whilst minimising the impact on the environment.

We are committed to maximising economic benefits for the UK's oil and gas reserves and maintaining production levels of three million barrels of oil equivalent per day until 2010.

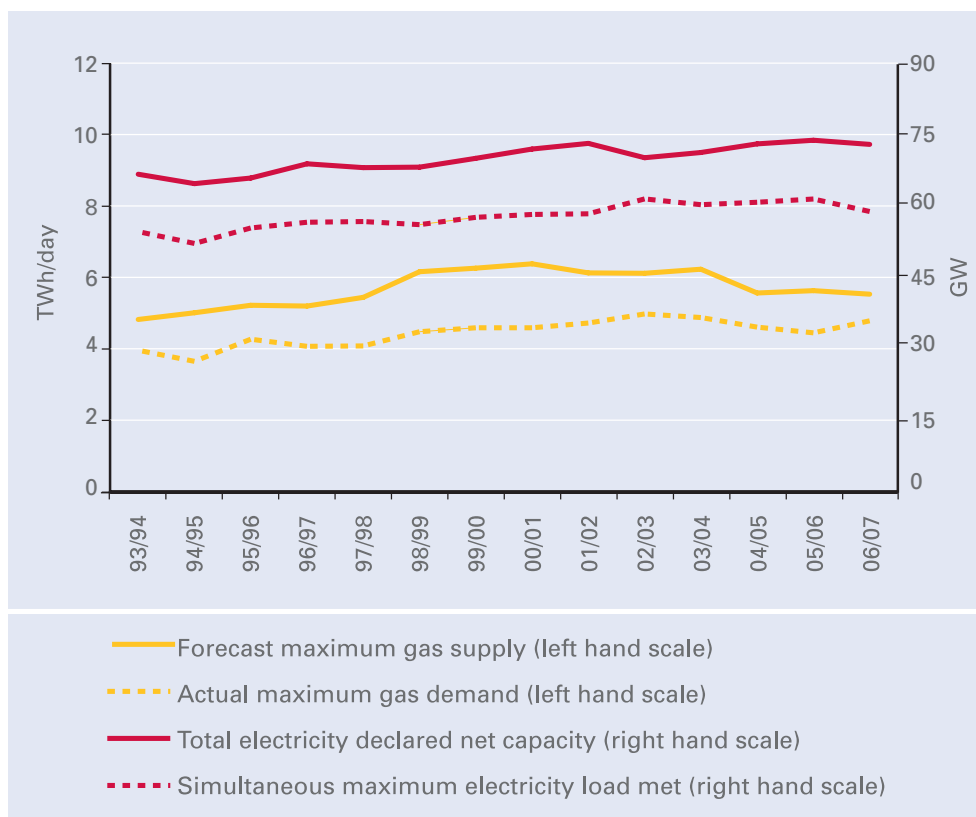
Progress to date

3.1 After a relatively tight gas market last winter (2005/06), supplies of gas and electricity have comfortably met demand this winter and there have been no potential shortages of supply since the Gas Balancing Alert in March 2006 and the electricity Notice of Insufficient Margin (NISM) in July 2006. UK North Sea gas production has continued to meet a significant proportion of demand, and there have also been substantial and consistent flows through new import infrastructure – the Langeled pipeline from Norway and the BBL pipeline from the Netherlands. In addition, the Rough storage facility (in the Southern North Sea) was repaired and was full ahead of the winter along with medium-range storage.



Progress to date

**FIGURE A2. GAS AND ELECTRICITY CAPACITY MARGINS –
MAXIMUM SUPPLY AND MAXIMUM DEMAND 1993/94 TO 2006/07**



Data for winter 2006/07 are provisional

Source: National Grid and DTI

3.2 Wholesale gas prices have fallen considerably since last winter, with the average for this February being 20p per therm compared to 65p per therm for February 2006. This reflects the completion of new import infrastructure on or ahead of time, increased confidence in the availability of supplies, and modest demand due to mild weather both here and on the Continent. There has also been considerable price convergence with the Continent on both the spot and the forward markets.

3.3 On electricity, there was sufficient margin of installed capacity (22%) to accommodate long-term outages at a number of nuclear and coal-fired stations. Gas and coal were the most important contributors to the generation mix, each accounting for around 40% of electricity generation, with nuclear accounting for most of the rest. For coal, this is down on the 50% it supplied last winter, largely because of increased gas fired-generation, reflecting lower gas prices.

3.4 With reductions in the wholesale price, the situation for industrial consumers buying gas at current prices should therefore have eased. However, gas prices remain uncomfortably high for users who negotiated contracts when the forward price was high, e.g. last summer, though there is evidence that some of these contracts are being re-negotiated on a "blend and extend" basis.

3.5 In July 2006, the Government established the Business Energy Forum to ensure that sound preparations were made for winter. This is a high level group, jointly chaired by DTI and CBI and bringing together Ofgem, National Grid, energy suppliers and users and other key players in the energy industry. The group met three times in 2006 to ensure there was effective communication and co-ordination of effort. As part of this, DTI created a dedicated webpage¹⁰ to provide information and signposting on winter energy supply issues.

3.6 The work of the Gas Supply Infrastructure Task Force has been followed up with a number of specific Government measures. These are: proposals to streamline and simplify the existing onshore consents process (set out in the Government's 2007 Planning White Paper); proposals to deliver regulatory certainty to those considering the offshore storage of gas and offshore unloading of Liquid natural Gas (public consultation closed in February 2007, and legislation is to be taken forward as soon as Parliamentary time allows); and a focus on the provision of information to the public, and local decision makers in particular. In May 2006, the Secretary of State published a Parliamentary Statement of Need for Additional Gas Supply Infrastructure to clarify the Government's views on the pressing need for new infrastructure in the UK. In addition, the Government continues to identify and tackle regulatory obstacles to new gas supply projects, working with developers from an early stage in the planning of new projects.

3.7 The North Sea continues to be critical to delivering the energy needs of the country and there are still substantial quantities of oil and gas to be produced. The Government is working closely with industry to ensure we have the best licensing, environmental and business frameworks to attract the investment needed to deliver the North Sea's full potential.

3.8 The key PILOT (the UK industry/Government oil and gas forum) initiatives in the last few years are acknowledged as highly successful by all sides: promoting North Sea overseas and attracting new players; enhancing licensing system; freeing up fallow (unworked) acreage; improving commercial behaviours and infrastructure access; and finding ways to recover more oil and gas from existing "brown" fields (Stewardship Initiative). The Government and industry will continue to push in these and other areas to ensure that North Sea investment and economic recovery of hydrocarbons is maximised.

3.9 The 24th offshore oil and gas Licensing Round demonstrated the continuing attraction of the UK Continental Shelf. Offers of 150 oil and gas exploration and production licences were announced in February 2007 to 104 companies covering 246 blocks, continuing the record numbers of licences issued last year.



4. Competitive Energy Markets (including energy prices)

Commitment

Our goal is to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve productivity.

Ensuring an open and competitive market throughout Europe remains a priority for the UK.

Progress to date

4.1 The UK energy market remains the lowest in the EU15¹¹ for domestic gas prices, and below average for domestic electricity prices, and recently announced price reductions will act to decrease prices. Price increases over the past year have moved the UK above the EU median for industrial consumers which have historically been below average.

4.2 The European Commission published its *Strategic Energy Review – an energy policy for Europe* in January 2007. Among other issues, this made a number of welcome proposals for the development of the internal energy market. Key among these were:

- greater unbundling of energy network businesses from other activities; this would ensure that vertically integrated companies are unable to use privileged information from their network operations to block market entry by competing suppliers and generators;
- more effective regulation; ensuring that all national regulators have sufficient powers and independence to carry out their tasks; and establishing a regulatory structure to oversee the development of cross-border technical standards and trading arrangements, with several ways of doing this suggested; and
- greater transparency; more information is needed from some transmission system operators to ensure that markets can function, so minimum requirements should be developed.

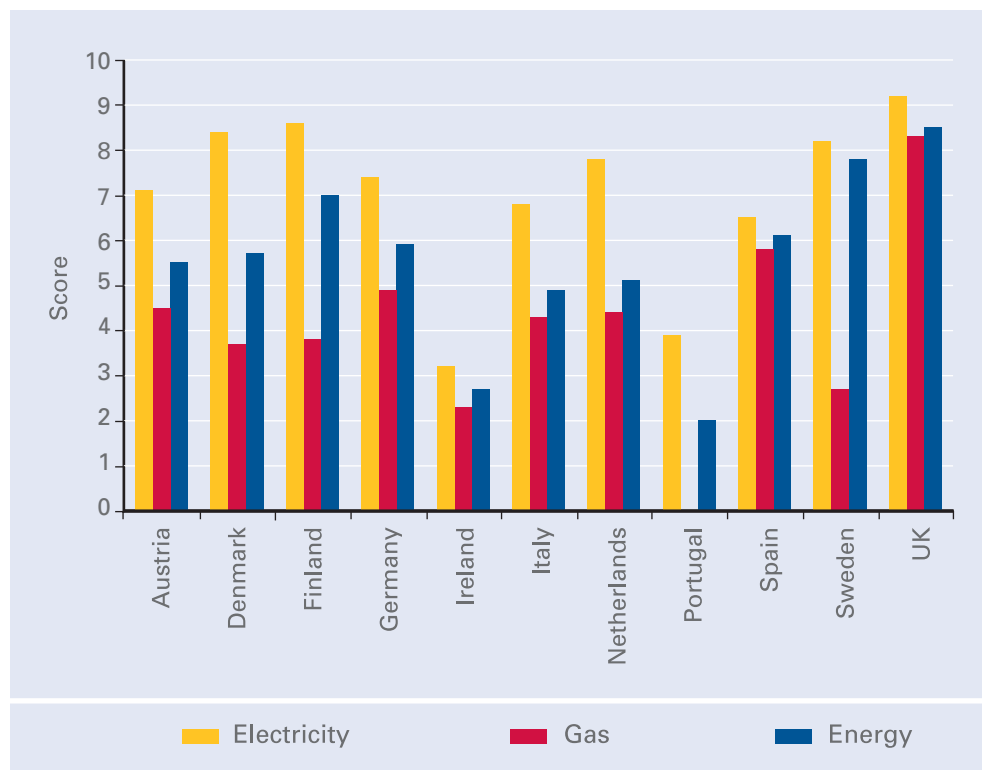
We support these proposals, which we see as essential if the market is to develop further.¹²

¹¹ EU15 refers to the 15 countries in the European Union prior to the expansion in 2004 and 2007.

¹² These proposals were endorsed by the European Council in spring 2007. The Commission has been asked to bring forward detailed proposals by the end of this year.

Progress to date

FIGURE A3. OVERALL COMPETITIVENESS SCORE FOR SELECTED EU ENERGY MARKETS (USING PRELIMINARY 2005 DATA)



Source: Study undertaken by OXERA on behalf of DTI

<http://www.dti.gov.uk/files/file35324.pdf>

5. Tackling Fuel Poverty

Commitment

The goal of the UK Government is to seek an end to fuel poverty by 2016-18 with various interim targets in each Devolved Administration.

Progress to Date

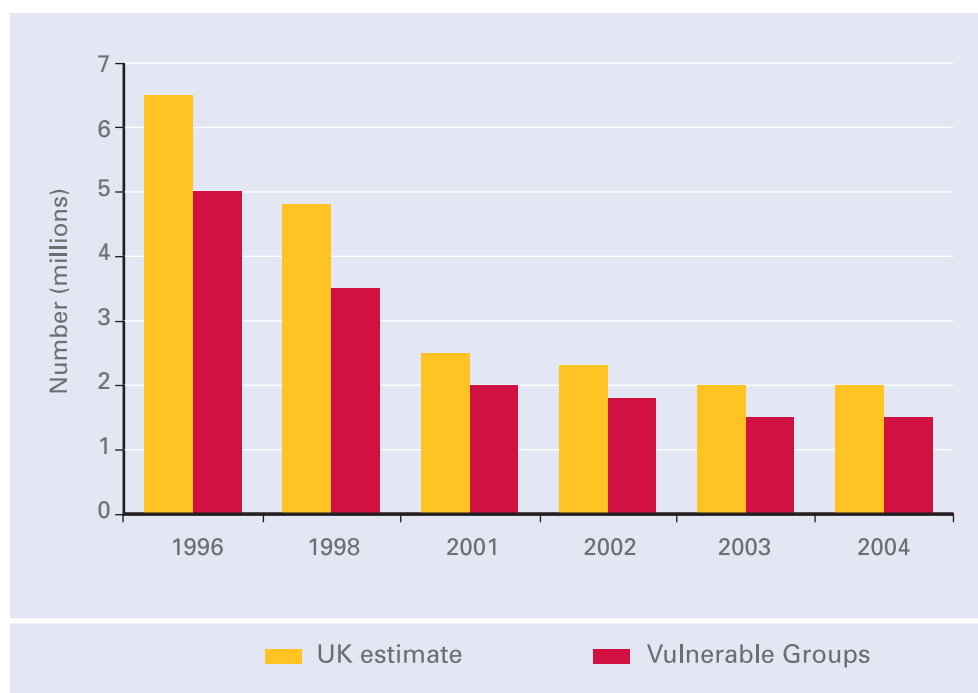
5.1 The latest estimates published in the *UK Fuel Poverty Strategy Fourth Annual Progress Report 2006* indicate that, in 2004, there were approximately two million households in fuel poverty in the UK. One and a half million of those were vulnerable households. This represents a fall of around four and a half million households overall, and of around three and a half million in the number of vulnerable households, from 1996 levels. Fuel poverty is a devolved issue, with separate targets and differing policy approaches across each of the devolved nations. Official figures for 2005 will be produced later this year in the *UK Fuel Poverty Strategy Fifth Annual Progress Report 2007*. Scotland, Wales and Northern Ireland have dedicated advisory bodies to help meet our fuel poverty targets.¹³

¹³ The Fuel Poverty Advisory Group for England's Fifth Annual Report was published in April 2007 and contained a number of recommendations that the Government will respond to in the UK Fuel Poverty Strategy Fifth Annual Progress Report.



Progress to date

FIGURE A4. NUMBER OF HOUSEHOLDS IN FUEL POVERTY (UK)



Source: DTI, for further details on fuel poverty see
<http://www.dti.gov.uk/energy/fuel-poverty/index.html>

5.2 The number of vulnerable households in fuel poverty in England in 2004 remained at broadly the same level of 1.0 million, with 1.2 million households in total in fuel poverty (around 6% of English households). Warm Front is the Government's main tool for tackling fuel poverty in the private sector in England. The Scheme provides a package of heating and insulation measures to vulnerable households in receipt of certain qualifying benefits. From the introduction of the Scheme in June 2000 to the end of March 2007, over 1.4 million households received assistance. Warm Front also carries out Benefit Entitlement Checks for those not eligible for the Scheme at the point of application, or where the provision of measures has not increased the energy efficiency of the property to an agreed level. The average increase in income from a successful Check is around £1,300.

5.3 The number of households in fuel poverty in Scotland in 2004/05 was 419,000 (18% of Scottish households), an increase of 69,000 compared to the previous year. The key scheme for tackling fuel poverty in Scotland are the Central Heating Programme and Warm Deal. To date, the Central Heating Programme has installed central heating systems and insulation in 81,000 homes. The Warm Deal Programme, which provides insulation measures (primarily loft and cavity wall insulation), energy efficiency advice and a Benefit Entitlement Check has so far insulated 238,000 homes, bringing the total number of homes insulated in Scotland to 319,000, around 14% of the housing stock. From January 2007, eligibility for Warm Deal was extended to include households with disabled children. So far, the Scottish Executive has spent over £300 million on these two highly successful programmes. As a result, the cost of heating participating homes to an acceptable standard has halved.

5.4 The total number of households in Wales in fuel poverty in 2004 was 130,000, which represented 11% of Welsh households. Modelling to update these figures to 2005, taking into account increases in incomes and fuel prices, showed that there is likely to be 30,000 additional fuel poor households. The Home Energy Efficiency Scheme (HEES) is the Welsh Assembly Government's main vehicle for lifting Welsh households out of fuel poverty. To date, the Scheme has assisted over 70,000 households in Wales by supplying central heating and energy efficiency measures. The Welsh Assembly Government has made significant extra resources available with HEES receiving a further £5 million in both 2006/07 and 2007/08. Since August 2004, all households applying to the Scheme have been offered benefits advice, to ensure that they maximise both the assistance available to them under HEES and access benefits to which they are entitled. This has resulted in £2.26 million in unclaimed benefits being identified.

5.5 The latest figures for 2004 show a substantial decrease in the numbers in fuel poverty in Northern Ireland, from 203,300 (33% of all households) in 2001 to 153,500 (24% of all households) in 2004. Warm Homes and Warm Homes Plus are the main instruments for tackling fuel poverty in the owner-occupied and private rented sector in Northern Ireland. Since 2001, over 70,000 households have received assistance. Funding for the scheme has increased significantly, from just over £3 million in 2001 to just over £20 million in 2006/07 and 2007/08. In addition, the eligibility criteria for Warm Homes Plus was extended to ensure that the over 60s, in receipt of disability related benefits, will now receive full heating systems as well as insulation measures and a benefit maximisation programme was introduced in July 2006 to provide a social security benefit health check to all recipients of the scheme.

5.6 Under the Energy Efficiency Commitment (EEC), electricity and gas suppliers are required to meet targets for the promotion of improvements in household energy efficiency in Great Britain. As a result of the focus on the priority group of low-income consumers, EEC will make a contribution to the alleviation of fuel poverty. As at February 2007, the second phase of EEC, from 2005-08 had delivered around 50TWh of lifetime energy savings in the priority group.

5.7 The Decent Homes Standard is a minimum standard below which homes should not fall. It is a trigger for action and not a level that remedial work should be completed to. Indeed the majority of local authorities and registered social landlords are carrying out work well in excess of the thermal comfort standard with 90% planning to install both cavity and wall insulation and loft insulation even where the standard only requires one¹⁴. The standard requires the presence of efficient heating and effective insulation in homes. Progress is being made on thermal comfort at a faster rate than the other components of the decent homes standard, and the number of social sector homes failing on that criterion has more than halved since 1996 – from nearly two million down to 850,000. The average SAP score for social housing in 2005 was 57 compared to 47 in 1996. The work that social landlords in particular have carried out has contributed to reductions in fuel poverty.

¹⁴ Assessment of implementing decent homes in the social sector: *Housing Research Summary* Number 238, 2007 <http://www.communities.gov.uk>



5.8 The 2005 Pre-Budget Report announced that an additional £300 million would be made available to tackle fuel poverty across the UK. In England, this means that funding for the Warm Front Scheme will exceed £300 million in 2006/07, and puts total funding for the Scheme over the 2005-08 period in excess of £800 million. This represents a substantial contribution to our work in this area, and will strengthen the ability of the Scheme to target and deliver assistance to the most vulnerable households. It also announced a £300 contribution towards the cost of a central heating system for those householders over 60 who are not able to receive Warm Front assistance.

5.9 In the Pre-Budget Report 2006, an additional £7.5 million was announced to support the development of projects which use an area-based approach to identify the needs of each household in order to provide them with a co-ordinated and tailored set of advice and measures. This will complement our existing fuel poverty and carbon abatement schemes for the domestic sector.

5.10 The average price paid by households for electricity and gas in 2006, compared to the average price for 2004, rose in real terms by 45% for gas and 29% for electricity. This means that energy prices in 2006 were around 1984 levels for gas and around 1996 levels for electricity. Energy prices to households began to reduce in early 2007, however the price increases will have increased fuel poverty levels.¹⁵

5.11 We have acted on each of the commitments outlined in the Energy Review Report in relation to fuel poverty. Through industry and the Government working together, we delivered a targeted mail-out offering energy efficiency and income assistance to 100,000 Pension Credit recipients. We are now looking to take this forward for next winter. The funding from the Pre-Budget Report 2006 supports the development of area-based projects. New technologies are being brought into the portfolio of measures offered by many of the main UK fuel poverty schemes. Alongside this, the Low Carbon Buildings Programme is hoping to attract bids from social housing providers seeking to install microgeneration for low income, hard to reach properties.

¹⁵ Projections for fuel poverty are included in the Energy White Paper: *Meeting the Energy Challenge*.

6. Additional reporting following the Energy Act 2004

Energy Sources and Technologies

6.1 Section 81 of the Energy Act 2004 requires the Government to include information in this annual report about a range of energy sources and technologies. Specifically “work carried out to develop or use listed energy sources or technologies: clean coal technology; coal mine methane; biomass; biofuels; fuel cells; photovoltaics; wave and tidal generation; hydrogeneration; microgeneration; geothermal sources, and any other energy source/technology which may cut carbon emissions.” Detail on each is in the table below.

Type of energy source/technology	Action proposed or taken to develop or deploy
Carbon reducing technologies (including coal)	<p>Research and Development:</p> <p>A demonstration scheme for Carbon Abatement Technologies was launched in September 2006 (£35 million over 3 years) with the first call for applications taking place in October 2006.</p> <p>UK CCS Demonstration:</p> <p>In January 2007, PB Power were appointed to carry out an engineering study into the costs of UK based Carbon Capture and Storage (CCS) power generation demonstration, with a view to making a decision on whether to support UK based CCS demonstration in 2007.</p> <p>Regulation:</p> <ul style="list-style-type: none"> • A regulatory task force was set up in May 2006 to consider and take forward issues related to CCS regulation. • In November 2006 we secured an amendment to the London protocol allowing carbon to be stored in sub-seabed geological formations. • As an interim solution for Phase II of the EU ETS (2008-12), the EC said in December 2006 that CCS projects can be “opted-in as a new activity” and the UK is proactively pursuing this route to ensure recognition in Phase II. <p>International:</p> <p>We continued to work with international partners through the G8 and EU and bilaterally to speed the safe deployment of CATS including CCS. For example, the UK is leading the forthcoming EU Near Zero Emissions Coal (NZE) initiative in China and is actively pursuing a similar project in India.</p>



Type of energy source/technology	Action proposed or taken to develop or deploy
	DTI continued to be active internationally in a number of bodies such as the International Energy Agency's Working Party on Fossil Fuels, the Carbon Sequestration Leadership Forum as well as the EU's Energy Technology Platform for Zero Emission Fossil Fuel Power Plants.
Combined Heat and Power	On 15 December 2006 DTI issued new Guidance to power station developers to maximise the use of CHP where feasible. For the first time, this Guidance gives developers access to information on regional heat customers through DEFRA's interactive heat maps. The Guidance also includes clearer instructions on what information is required from developers.
Coal Mine Methane	Existing and planned commercial utilisation of gas at major emitting sites, combined with funding constraints, has meant that plans to introduce a grant scheme for the flaring of methane emissions has been postponed.
Biomass	<p>The Government published our response to the Biomass Task Force in April 2006 and committed to forming a long term strategy for Biomass.</p> <p>In December 2006, DEFRA announced a five year continuation of the scheme to support the installation of biomass-fuelled heat and combined heat and power projects in the industrial, commercial and community sectors in England, with funding of £10-15 million available for the first two years.</p>
Biofuels	<p>The Government has developed its plans to introduce a Renewable Transport Fuel Obligation (RTFO) in April 2008 as one of the main UK policy instruments in the transport sector to reduce greenhouse gas emissions and to increase the use of renewable fuels, helping to meet UK international obligations under the Kyoto agreement and the EU Biofuels Directive. The RTFO will require transport fuel suppliers to ensure that a certain percentage of their total transport fuel sale in the UK comes from biofuels. The level of the RTFO will be 2.5% in the financial year 2008/09, rising to 3.75% in 2009/10 and 5% in 2010/11. The Government issued a consultation document¹⁶ on 22 February 2007 covering both the detailed design of the RTFO and how it might evolve over time and beyond 5% provided that conditions around sustainability, technical feasibility and costs to consumers are met and that it represents an effective use of UK biomass resources.</p>

16 <http://www.dft.gov.uk/consultations/open/drafttrfo>

Type of energy source/technology	Action proposed or taken to develop or deploy
Photovoltaic (PV)	<p>The Major PV Demonstration programme closed in March 2006, although projects were given until April 2007 to complete.</p> <p>The PV field trials (domestic and large scale) have been completed.</p> <p>The Government continues to support PV through the Technology Programme and the Low Carbon Buildings Programme.</p>
Hydrogen and Fuel Cells	<p>A demonstration programme for hydrogen and fuel cells (£15 million over 3 years) was launched in September 2006. The first successful projects are expected to start early in the financial year 2007/08.</p>
Wave and Tidal	<p>In 2006 the Government continued to support research and development of marine energy technologies primarily through the DTI's Technology Programme. Under the programme a further 7 new research and development projects were supported, with levels of assistance totalling £2.75 million and typically at 50% of project cost. These new projects brought the total number of ongoing marine energy technology R&D projects supported by the DTI to 16 with grant support totalling £17.3 million.</p> <p>In February 2006 DTI launched a £42 million "Wave and Tidal Stream Energy Demonstration Scheme" that will support the first multi-device demonstration projects.</p> <p>The Carbon Trust announced a major new £3.5 million initiative in marine renewable energy called the Marine Energy Accelerator (MEA). The programme aims to accelerate progress in cost reduction of marine energy technologies.</p> <p>In August 2006 DTI offered £4.5 million towards the cost of an infrastructure project known as the "Wave Hub". The proposed "Wave Hub" is an electrical grid connection point 15 km offshore into which wave energy devices can be connected. The "Wave Hub" approach would bring a number of benefits to developers, including a well defined and monitored site with electrical connection to the on-shore electricity grid and a simplified and shortened consents process, reducing the risk for developers of the first pre-commercial wave arrays.</p> <p>In 2006 the European Marine Energy Centre (EMEC) in Orkney completed a £7.2 million project to extend the current facilities to include tidal-stream testing berths.</p>



Type of energy source/technology	Action proposed or taken to develop or deploy
	<p>A new £6 million 4 year programme of fundamental research into marine energy involving a number of UK universities and known as "Supergen Marine" was approved by the Research Councils. This new programme builds upon research carried out under the previous Supergen Marine I research programme.</p> <p>In July 2006 a major £400k study on tidal power in the UK was commissioned by Government. The study led by the Sustainable Development Commission will consider the UK tidal resource and the technologies to harness tidal energy including tidal barrages. In particular the study looks at the potential for tidal power developments in the Severn Estuary and related issues in depth. The study is planned to report in summer 2007.</p>
Hydro generation	<p>The Environment Agency Hydropower Working Group (EAHWG) consisting of the DTI, the Environment Agency and the hydropower industry, continues to work together to find the best solution for developers to deploy hydropower while best protecting the environment.</p>
Micro generation	<p>The microgeneration strategy was published in March 2006 with the objective being to create conditions under which microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, the community and small business.</p> <p>A steering group has been established to drive forward implementation of the strategy. Of the 25 actions in the strategy, 6 have been completed in the period of this report. Progress can be followed at – www.dti.gov.uk/energy/sources/sustainable/microgeneration</p>
Geothermal sources	<p>The Government published in 2002 "Assessment of Technological Options to address Climate Change". Costs remain a significant barrier to geothermal energy in the UK. However, its potential globally is significant and we continue to keep it under consideration.</p>

Science and Engineering

6.2 Section 81 of the Energy Act 2004 also requires us to report on “the maintenance of scientific and engineering expertise in the UK for the development of energy sources.”

Action taken in the last 12 months:

6.3 The Sector Skills Councils, Cogent and Energy & Utility Skills have, as part of their Sector Skills agreements undertaken a full assessment of the current situation and are developing strategic plans with their client industries and other interested parties to ensure that the needs of the energy sector are met;

6.4 The Cogent led National Skills Academies for Nuclear and the Process Industries were approved in October 2006:

- the Nuclear Academy will aim, in its first three years, to deliver 800 apprentices and around 150 Foundation degrees. A further 4,000 existing employers will be up-skilled and re-trained using short courses; and
- although the Process Industries Academy is primarily aimed at the chemical process sector, the refinery and power industries will also benefit.

6.5 Research Councils are spending £40 million per annum on energy R&D and this has a significant feed through to the supply of high-level skills. The Energy Technology Institute will add up to £100 million per annum of extra funding.

6.6 Training and research in nuclear has been increased by universities.

This includes:

- The Nuclear Technology Education Consortium are offering 20 modules at Masters level;
- seven universities are participating in the Engineering and Physical Sciences Research Council (EPSRC)-funded research programme *Keeping the Nuclear Option Open*;
- EPSRC is supporting the Nuclear Doctorate Centre, a collaboration between Manchester’s Dalton Institute and Imperial College London; and
- Lancaster University provides an undergraduate course in nuclear engineering.

6.7 There is a significant oil industry programme under the strategic direction of PILOT and the management of the Industry Leadership Team to address the need for craft and technician skills to replace those retiring. Around 150 new recruits each year are starting apprenticeships, with training delivered under the direction of Cogent and the Engineering Construction Industry Training Board (ECITB).

6.8 The Energy Research Partnership, a high level energy sector forum launched in the 2005 Budget and tasked with enabling the UK to become a world leader in developing innovative energy technologies, has initiated a workstream to improve the supply of high-level skills.

6.9 Membership of Ofgem’s Innovation Funding Incentive for electricity distribution companies has been broadened to include electricity and gas distribution companies. The Incentive aims to re-invigorate R&D within the sector by bringing industry and universities closer together, helping supply chain companies to bring in new technology and developing technical skills for the future.



6.10 The Government's commitment to increasing the supply of Science, Technology, Engineering and Mathematics (STEM) skills to the workforce was reinforced by the actions set out in the March 2006 *Science and innovation 2004-2014: framework next steps*, and the DTI/DFES STEM Programme Report in October 2006. The new National Curriculum places increased emphasis on science, technology and mathematics and has changed the method by which schools are assessed to give greater weight to attainment in English and Mathematics.

Nuclear Research and Development

6.11 The Government recognises that research plays an important role in maintaining nuclear competence and knowledge (around 20% of the UK's electricity comes from nuclear power).

6.12 The UK invests in fusion research through the Engineering and Physical Sciences Research Council (EPSRC) and the UKAEA undertakes the vast majority of the fusion research in the UK.

6.13 As a result of a new grant announced in August last year, EPSRC grant awards to UKAEA Culham will amount to around £95 million over the four years to 2007/08. The EPSRC funding covers the UK's own national programme of fusion research and the UK's contributions to the operation of Joint European Torus (JET). The UK also makes a contribution to the European fusion programme via its overall contribution to the EU budget.

6.14 Ministers from the seven ITER Parties signed the ITER agreement to establish the international organization that will implement ITER on 21 November. ITER is a global scientific collaboration on fusion research and involves the EU, China, India, Japan, Russia, Republic of Korea, and the United States.

Energy Efficiency

6.15 Section 81 of the Energy Act 2004 requires the Government to report on progress towards achieving its energy efficiency aims.

6.16 Reducing the amount of energy we use is the best way of achieving all of our energy goals, with an additional benefit of reducing costs to homes and businesses.

Commitment

- The 2004 Energy Efficiency Action Plan included a residential energy efficiency aim, to save 3.5 million tonnes of carbon from homes in England through energy efficiency measures by 2010. A revised Energy Efficiency Action Plan, which is to be published this summer in accordance with the requirements of the End-use Efficiency and Energy Services Directive, will serve to review the ambition of the aim.
- A second target for household energy efficiency was set in the Housing Act 2004, requiring the Secretary of State to take reasonable steps to improve residential energy efficiency by at least 20% by 2010 from a year 2000 baseline.

6.17 In 2006, as part of the review of our Climate Change Programme, we undertook a comprehensive review of the measures in the 2004 Energy Efficiency Action Plan and announced a strengthened policy package – all told energy efficiency policies are now expected to deliver over half the carbon savings in the new Climate Change Programme.

6.18 In the Energy Review Report we looked towards 2020, with a range of proposals for further policies and measures to help deliver an extra 6-9 MtC per annum by 2020.

Specific action taken this year includes:

6.19 We have significantly strengthened building standards. New provisions in the building Regulations in April 2006, mean (with previous revisions in 2002), a 40% improvement in the energy performance of buildings built to today's standards.

6.20 The Government also published a consultation on our aim that all new homes should be zero-carbon by 2016, an ambitious target. This will be achieved through further progressive tightening of the building regulations in 2010 and 2013 before the zero-carbon standard comes into effect in 2016.

6.21 To support the Government's ambition for zero carbon development, we have also published the Code for Sustainable Homes, the draft Planning Policy Statement: Planning and Climate Change and have committed in the Thames Gateway Interim Plan to explore the feasibility of making the Gateway zero/low carbon.

6.22 To kick-start deployment of the technologies that will be needed to realise this goal, the Chancellor announced in December 2006 that the Government will introduce a time-limited stamp duty exemption in 2007 for the vast majority of new zero carbon homes.

6.23 In the Budget 2006, the Chancellor announced the Retailers Initiative under which we will work with the Energy Saving Trust and retailers to introduce voluntary schemes to raise the energy efficiency of the goods they sell.

6.24 In the Energy Review Report we announced a commitment to maintain a household supplier obligation until at least 2020 following on from the 3rd phase of the Energy Efficiency Commitment, which comes to an end in 2011. We are committed to save 3-4 MtC by 2020 through this instrument. The Review also included proposals for raising awareness of energy use through better metering and billing and for adopting measures to secure savings of 1.2 MtC per annum from large commercial and public sector organisations. We also announced that, by 2012, the Government office estate will be carbon neutral and have set an aspirational target to reduce carbon emissions from the estate by 30% by 2020.

6.25 The Government has adopted a Sustainable Procurement Action Plan, a package of actions to deliver the step change needed to ensure that supply chains and public services will be increasingly low carbon, low waste and water efficient, respect biodiversity and deliver wider sustainable



development goals. Alongside the Action Plan, the Government is also publishing an updated set of mandatory environmental product standards that will ensure Departments procure the most sustainable commodities.

6.26 The EU has adopted an Energy Efficiency Action Plan which comprises a package of policies and measures to realise the potential for saving 20% of the EU's primary energy consumption by 2020.

6.27 The UK's energy tax, the climate change levy (CCL), which was introduced in 2001 to encourage businesses to reduce energy demand will be increased in line with inflation from April 2007.

6.28 The Pre-Budget Report in 2006 announced new investment of £7.5 million to improve the coordination between, and effectiveness of, Warm Front and the Energy Efficiency Commitment. This will fund projects using an area-based approach to identify households and provide the right coordinated set of advice and measures for them.

6.29 Subject to any necessary State aids clearance, the Landlords Energy Saving Allowance will be extended to corporate landlords and will be applied per property rather than per building, ensuring that even smaller properties have access to the full allowance. The acquisition and installation of floor insulation will also be a qualifying investment.

Summary of Updated Energy and Carbon Emissions Projections

Headline carbon emissions projections to 2020

1 This annex provides a summary of the results of the latest UK energy and carbon emissions projections¹. The following baseline projections reflect low, central and high assumptions of future fossil fuel prices; and the estimated impact of the Energy White Paper measures under central fuel prices. In addition, these projections explore the impact of a carbon price² for the UK sectors covered by the EU Emissions Trading Scheme (EU ETS).

Baseline projections

2 Depending on the price of fossil fuels, and without the impact of the EU ETS and the measures in this White Paper, UK domestic carbon emissions are projected to be 149 -151 million tonnes of carbon (MtC) in 2020³ (Table B1 below). This is 3-5 MtC higher than previous central baseline projections published in the Energy Review Report in July 2006. Part of the reason for this is that our projections now include a higher level of coal-fired electricity generation in 2020 than we projected last July, due to revised assumptions about the future level of fossil fuel prices⁴.

TABLE B1. BASELINE PROJECTIONS UNDER LOW CENTRAL AND HIGH FOSSIL FUEL PRICES

	2010	2015	2020
Low fuel prices	146.9	150.7	149.2
Central fuel prices	146.5	149.4	151.2
High fuel prices	145.8	149.1	150.5

1 A more detailed paper on the updated energy and carbon emissions projections is being published alongside this White Paper DTI: *Updated Energy and Carbon Emissions Projections*, May 2007. www.dti.gov.uk/energy/whitepaper

2 Except in the baseline projection, a carbon price of €20/tCO₂ in 2010 and €25/tCO₂ in 2015-2020 is assumed for the EU ETS sectors in the UK.

3 This baseline includes savings in 2020 of around 25MtC from existing measures.

4 The revised fossil fuel price assumptions used in these projections were put out to consultation in October 2006. The revisions to our fossil fuel price assumptions show an increase in expected future fuel prices, consistent with other major organisations (IEA and EIA) and reflecting market tightness and higher costs of production. The revision has also meant that the assumed relative price of fossil fuels has changed. In the baseline scenario, and without a carbon price, the price of coal is now more favourable compared with that in the July 2006 projections. This contributes to an increase in coal capacity in the new baseline of up to 8GW by 2020.



Projections of the impact of EU ETS carbon price in the UK and the impact of the 2007 Energy White Paper measures

3 The projections published in this White Paper (and in contrast to the projections published with the Energy Review Report) incorporate an EU ETS carbon price for UK sectors of €20/tCO₂ in 2010 and €25/tCO₂ in 2015-2020.

4 The exact level of savings from the EU ETS beyond Phase II (2008-2012) will be decided in line with future national allocation plans. However, in this White Paper we present an illustrative projection of savings from the EU ETS in 2020 under central fuel prices of 13.7MtC⁵. Our projections show that in order to meet this level of effort, the EU ETS sectors in the UK will be required to purchase emissions allowances from abroad.

5 Table B2 below details the headline aggregate 2007 Energy White Paper projections. These are based on central fossil fuel price assumptions⁶. The range reflects the low, central and high carbon savings estimated to be achieved through the White Paper measures⁷ (as described in Table 10.1 in chapter 10). These estimates also include the estimated full impact of the EU ETS carbon price and the additional effort from purchasing emissions allowances from abroad.

TABLE B2. HEADLINE 2007 ENERGY WHITE PAPER PROJECTIONS (CENTRAL FUEL PRICES)				
Projections (MtC)	1990	2005	2010	2020
Baseline	161.5	151.1	146.5	151.2
Emissions projection including full impact of EU ETS and assuming low impact of White Paper measures	161.5	151.1	136.1	128.9
Emissions projection including full impact EU ETS and assuming central impact of White Paper measures	161.5	151.1	135.7	126.5
Emissions projection including full impact of EU ETS and assuming high impact of White Paper measures	161.5	151.1	135.2	119.2

6 Table B2 shows that, along with the impact of the EU ETS and depending on the level of savings from the White Paper measures, UK carbon emissions are projected to be 119.2-128.9 MtC in 2020; equating to a 20-26% reduction on 1990 levels (See Figure 10.1 in chapter 10 of this White Paper)⁸. Table B3 below provides more detail on sectoral projections compared to the baseline projections, under central fuel prices. The range reflects the low, central and high estimated carbon savings from the White Paper measures. The table also separates domestic carbon emissions, and emissions savings achieved through the purchase of allowances from abroad.

5 This estimate reflects the assumption that the cap for Phase II of the scheme is unchanged in future phases. On the basis of our latest baseline projections, this would require 13.7MtC of savings in 2020. The actual level of savings to be achieved through EU ETS beyond Phase II (2008-2012) will be decided in line with future national allocation plans.

6 Emissions projections under high and low fossil fuel and central policy saving assumptions are reported in the detailed paper on the projections. www.dti.gov.uk/energy/whitepaper.

7 This range reflects uncertainty about the timing and impact of the measures.

8 In the draft Climate Change Bill, the UK target is a 26-32% reduction in emissions on 1990 levels by 2020.

TABLE B3. BASELINE EMISSIONS AND LOW, CENTRAL AND HIGH EMISSIONS BY SECTOR (CENTRAL FUEL PRICES)

		Baseline		Low carbon saving		Central carbon saving		High carbon saving	
	2005	2010	2020	2010	2020	2010	2020	2010	2020
Power stations	47.0	45.3	49.0	44.2	38.8	43.5	36.4	42.8	32.9
Refineries	5.0	5.8	6.1	5.8	6.1	5.8	6.1	5.8	6.1
Residential	23.1	19.7	18.3	19.7	15.6	19.7	15.0	19.6	14.4
Services	6.5	6.2	6.6	6.1	6.0	6.1	5.8	6.1	5.6
Industry	30.8	30.8	29.9	30.8	29.7	30.8	29.6	30.8	29.6
Road transport ¹	32.7	32.5	33.9	32.4	32.2	32.4	32.2	32.1	27.2
Off-road	3.5	3.3	3.2	3.3	3.2	3.3	3.2	3.3	3.2
Other transport	3.1	3.4	3.7	3.4	3.5	3.4	3.4	3.4	3.3
LUC	-0.6	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5
Total²	151.1	146.5	151.2	145.2	135.6	144.4	132.2	143.4	122.9
Emissions allowances purchased from abroad³	–	–	–	9.1	6.8	8.7	5.7	8.3	3.7
Total including full impact of EU ETS	151.1	146.5	151.2	136.1	128.9	135.7	126.5	135.2	119.2

1 DTI forecasts of road transport emissions are consistent with, but at the top end of DfT emissions forecasts because of the different modelling approaches used.

2 Estimated carbon emissions inclusive of the impact of the 2007 White Paper measures and a carbon price – but excluding emissions savings achieved through the purchase of allowances from abroad.

3 Estimated allowances purchased by EU ETS sectors in the UK from abroad (either EU allowances from other Member States in the EU ETS; or through Kyoto flexible mechanisms such as the Clean Development Mechanism).

Greenhouse gas emissions projections

7 Under the Kyoto Protocol, the UK has a target to reduce greenhouse gas (GHG) emissions by 12.5% on 1990 levels by 2008-2012. The Kyoto target is based on a basket of greenhouse gases, of which carbon dioxide (CO₂) represents the largest share. The latest projections show that the UK remains on track to exceed its Kyoto commitment⁹. The EU has committed to cut total greenhouse gas emissions by 20% on 1990 levels by 2020, or by 30% if in conjunction with other countries.

8 Based on the carbon emissions projections shown in this annex, together with an estimate of non-CO₂ GHG emissions projections¹⁰ suggest that total UK GHG emissions will be between 147-159 million tonnes of carbon equivalent (MtCe) in 2020, i.e. 25-31% lower than 1990 levels. (Figure B1, below). This projection of UK GHG emissions is inclusive of savings of carbon

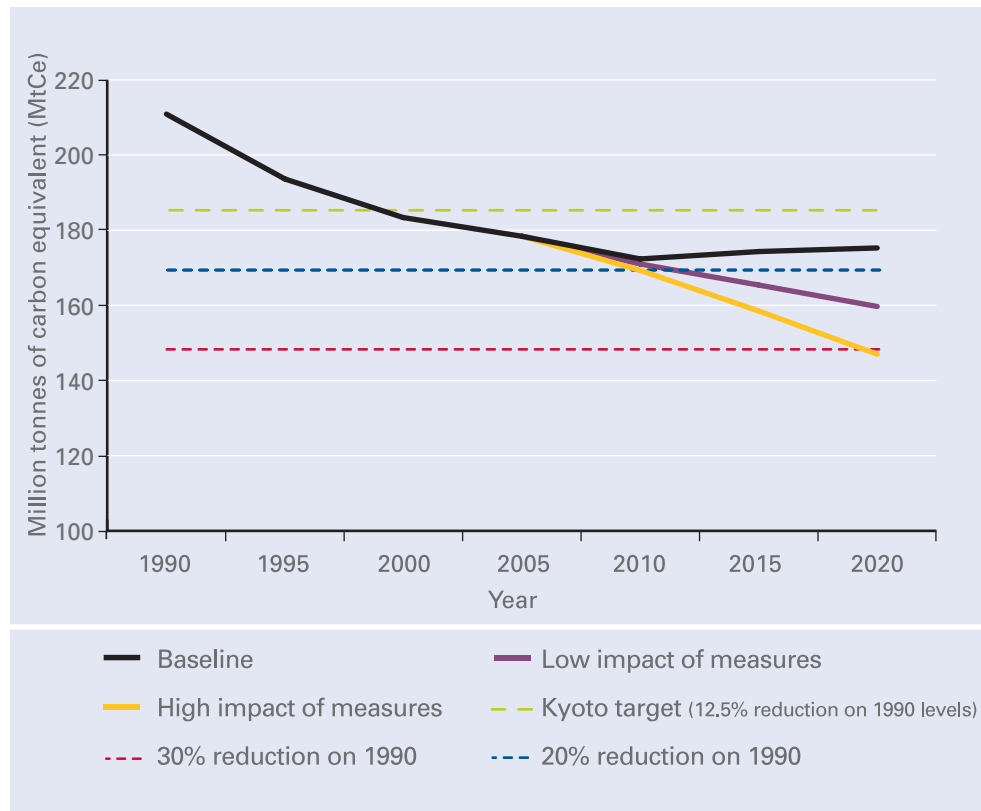
9 Defra, Provisional 2006 UK Climate Change Sustainable Development Indicator. <http://www.defra.gov.uk/news/2007/070329a.htm>

10 Provisional central estimates of non-CO₂ greenhouse gas emissions provided by Defra to the EU in March 2007. These estimates are under review to take account of the CO₂ projections provided in this White Paper, and other information that has become available since the 2006 Climate Change Programme was published. Fully updated estimates should be available in the second half of 2007.



achieved domestically through a carbon price of €20/t CO₂ in 2010 and €25/t CO₂ in 2015-2020¹¹, and is based on central fossil fuel prices.

FIGURE B1. PROJECTED GREENHOUSE GAS EMISSIONS (1990-2020)



Source: DTI Updated Energy and Carbon Emissions Projections May 2007

¹¹ These GHG projections do not take into account the estimated additional allowances purchased by EU ETS sectors in the UK from abroad.

Electricity generation mix

9 Table B4 sets out the fuel mix in electricity generation under central fuel prices in the baseline projection, and in the scenarios including the impact of a carbon price and the White Paper measures. The impact of the carbon price on the generation fuel mix is more significant by 2020, through its impact on the relative costs of generation and demand, favouring gas and nuclear generation at the expense of coal. The Government is consulting on the proposal of allowing the private sector the option of investing in new nuclear power stations. Because this issue is subject to consultation, we have only allowed the model to build new nuclear power stations in the high case, to show the potential impact of the proposal, for purely illustrative purposes.

TABLE B4. ELECTRICITY GENERATION MIX BY FUEL (CENTRAL FOSSIL FUEL PRICES)									
TWh	Baseline projections			Low policy estimates		Central policy estimates		High policy estimates	
	2005	2010	2020	2010	2020	2010	2020	2010	2020
Coal ¹	125	121	119	113	67	113	71	113	77
Oil	2	2	1	2	1	2	1	2	1
Gas	135	129	202	136	223	129	195	123	156
Nuclear	75	68	25	68	25	68	25	68	33
Renewables ²	17	31	48	29	46	33	57	36	67
Imports	11	11	16	11	16	11	16	11	16
Storage	3	3	3	3	3	3	3	3	3
Total	368	365	415	362	381	359	367	357	352

1 In the three policy cases, in line with our measures, some of the coal generation in 2020 is from CCS demonstration power stations – ranging between 3TWh in the low policy case to 13TWh in the high policy case.
2 Including renewables and waste.

Fossil-fuel price assumptions

10 Our emissions projections are based on a range of fossil fuel price assumptions. Fuel price assumptions are intended to be illustrative scenarios to reflect uncertainty over the outturn of future prices in the modelling – they are not detailed forecasts or predictions of future prices.

11 Table B5 compares the assumptions in the central fuel price scenario for the 2007 Energy White Paper projections, to those used in the projections in the Energy Review Report in July 2006.

TABLE B5. CENTRAL FOSSIL FUEL PRICE ASSUMPTIONS						
2006 real prices	Crude oil \$/bbl		Natural gas NBP p/therm		ARA coal £/tonne	
	Energy White Paper	Energy Review Report	Energy White Paper	Energy Review Report	Energy White Paper	Energy Review Report
2010	57	41	42	34	30	28
2015	50	43	38	36	31	27
2020	53	46	40	37	32	26



12 In the central fossil fuel price scenario, the oil price assumptions are higher than those for the Energy Review Report. The upward revisions are consistent with changes made by the International Energy Agency (IEA) and the US Energy Information Administration (EIA), and reflect the continuing market tightness and higher costs of production. It is assumed that oil prices ease post 2006 as new production capacity comes on-stream and demand growth moderates, leading to an increase in spare production capacity. However, as oil production will be increasingly produced from more expensive sources, and spare capacity remains relatively limited, prices are assumed to remain higher than their historic average. Under our new projections, oil prices are assumed to be 57\$/bbl in 2010 and 53\$/bbl in 2020 (2006 prices).

13 The gas price in Europe is assumed to remain linked to oil prices, and UK gas prices are assumed to be similar to continental prices plus the transport cost differential. Gas prices are assumed to be 42p/therm in 2010, and 40p/therm in 2020.

14 Coal prices are assumed to fall in the short-term due to additional investment in coal production and transport capacity, as a result of recent high prices. However, post 2010 coal prices are assumed to grow in line with oil and gas prices due to the opportunities for substituting between the different fossil fuels. Coal prices are assumed to be £30/tonne in 2010 and £32/tonne in 2020.

UK Position on the EU Emissions Trading Scheme

1 The Stern Review of the economics of climate change confirms that climate change is a global problem needing a multilateral solution, and that we must act now in response. The Review points to the need for a carbon price signal across countries and sectors to ensure that emission reductions are delivered in the most cost-effective way. The UK Government set out its own priorities in the EU ETS Vision statement in October 2006,¹ which followed the Stern Review, and this annex builds on that initial statement.

2 Emissions trading is the UK's carbon price instrument of choice and a key component in a comprehensive UK policy framework to effectively mitigate climate change. Emissions trading ensures that the emissions from the sectors regulated are capped, but it allows emissions reductions to occur where they cost the least, thereby minimising economic impacts and maximising flexibility for industry.

3 The EU, with a strong lead from the UK, has built on the Kyoto Protocol to take the world's most significant step in establishing a carbon price by establishing the EU Emissions Trading Scheme. The scheme already covers approximately half of the UK and EU's carbon dioxide emissions, including emissions from electricity production and major industrial sectors. EU Heads of Government recently re-affirmed their commitment to the scheme, with the Spring Council "... *[underlining] the central role that emissions trading must play in the EU's long-term goals to reduce GHG emissions, and [stressing] the importance of the review by the Commission of the EU Emissions Trading Scheme in delivering an improved EU ETS that provides a market-based, cost-effective means to deliver emissions reductions at minimum cost – including as regards energy-intensive industries – and to make a major contribution to the EU's overall targets*".²

4 But emissions trading will not achieve its full potential to reduce emissions at least cost unless we get the design of the scheme right. It is crucial that we learn the lessons from the first Phase, which was always intended as a learning by doing phase. In particular, it is clear from the price of allowances in Phase I of ETS that there was a generous allocation of allowances in that Phase. Indications are that the market believes that the allocation for Phase II is much tighter, as shown by the higher price for Phase II allowances, and that it will lead to significant reductions from business as usual emissions. For the future, the UK believes that the EU ETS should:

- set safe, predictable and affordable limits on emissions, which tighten over time. The European Council meeting of Heads of Government in Spring 2007 committed to a 30% reduction in emissions below 1990 levels, in conjunction with other countries (and by 20% in any event). This was a

¹ Available on HMT website at http://www.hm-treasury.gov.uk/media/7E3/FC/foi_gore_2.pdf

² See page 23 Brussels European Council Presidency Conclusions, 2 May 2007
http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/93135.pdf



major step forward, and gives a clear signal about the direction of travel, and the firm commitment that the future will be carbon-constrained;

- be improved such that it is more efficient with fewer distortions. We need to move towards more auctioning of allowances, and to increase transparency. This may be easier to achieve with a more centralised cap setting process;
- cover the right emitters. We welcome the progress on the inclusion of aviation, and urge the EU to consider whether sectors that are not currently in the EU ETS should be brought in, including surface transport. The inclusion of other greenhouse gases should also be considered. We need to look carefully at whether small emitters can be excluded where they face a disproportionate regulatory burden, but where a sector is not suitable for inclusion in the EU ETS, it should face a carbon price through some other route; and
- form the hub of a global carbon market. Stern makes it clear that a global market is essential. Designed correctly, the EU ETS can become the basis of a global carbon market, delivering the emissions reductions necessary to stabilise the concentration of greenhouse gases at a level to avoid the most serious impacts of climate change. Properly constructed links between the EU ETS, the Joint Implementation (JI) and Clean Development Mechanisms (CDM), and other markets where possible, will make the carbon market deeper and more liquid. We welcome the fact that the ETS Directive provides for continued recognition of JI and CDM credits in the EU ETS post 2012, though we must ensure that such mechanisms deliver real emissions reductions. The UK is working with other countries and states to promote emissions trading, to share the lessons of existing schemes and to develop compatibility for possible future links. This year's review of the ETS Directive will provide an opportunity to remove some of the legal obstacles to linking with regional and non-Kyoto schemes.

5 We are working, using robust evidence and analysis, to build a widely shared UK and EU consensus on emissions trading and the actions necessary to strengthen the EU ETS (set out above). This will build on the strong commitment to emissions trading from all EU Heads of Government at the 2007 Spring Council. A key tool in building this consensus is the UK Manifesto on the EU ETS³, which was launched in March 2007. This showed that Government, business and NGOs agree on the basic principles for emissions trading as an effective way to deliver emissions reductions. The priorities identified in the manifesto are:

- a predictable trajectory for the level of emissions reduction required;
- exposing all of business, eventually, to a carbon price. We will look to deliver this taking into account concerns about competitiveness of EU industry, where industry in other countries does not face a carbon price;

³ Available on the DEFRA website at <http://www.defra.gov.uk/environment/climatechange/trading/eu/pdf/manifesto-uk.pdf>

- use of JI/CDM and a global market;
- harmonisation. Business wants a level playing field in Europe, to avoid distortions in the Internal Market. The UK will work within Europe to deliver this, which will help to make the market more transparent and efficient; and
- carefully managed expansion. Eventually the whole economy must face a cost for carbon.

6 We will also consider how best to give the necessary confidence in the long-term direction of the scheme; we will look to make early decisions on emissions caps, and at how to signal the direction of EU emissions reductions much further into the future. We will also continue to press the Commission to produce a legislative proposal as soon as possible. To ensure that we have the detailed views of UK industry to feed into the Commission's thinking, we launched an issues paper⁴ in March 2007, asking for views on a range of questions about the future structure of the scheme.

7 This long-term confidence will be helped by the welcome commitment at Spring Council to a 2020 emissions target. This shows that Governments are aware of and responding to the need for long-term signals about emissions. In the UK, the draft Climate Change Bill has proposed to set in statute emission budgets for the UK three carbon budget periods (each of five years) ahead. We need to consider how the UK's EU ETS cap will be made consistent with both the EU's overall commitment, and the UK's domestic policy goals.



ANNEX D

Consultations announced in, or related to, the Energy White Paper: *Meeting the Energy Challenge*

Subject	
Planning	
The Future of Nuclear Power – The Role of Nuclear Power in a Low Carbon UK Economy	
Reform of the Renewables Obligation	
Guidance on the 1965 Gas Act	
Carbon Emission Reduction Target (formerly Energy Efficiency Commitment)	
Products Policy Brief on Consumer Electronics	
Offshore Decommissioning	
Supplier Obligation – call for evidence	
Carbon Reduction Commitment (formerly Energy Performance Commitment)	
Electricity: Emergency Planning	
CoRWM Implementation	
Energy Services Directive 2006/32/EC Article 6	
Billing and Metering	
Distributed Generation (licensing)	
UK Regulation of Carbon Capture and Storage	
Carbon dioxide from cars	
Code for Sustainable Homes	



Purpose	Expected launch date
To set out the Government's detailed proposals for reform in response to the recommendations made by Kate Barker and by Rod Eddington on planning, and consult on certain aspects of proposed planning reforms, including for major energy infrastructure projects.	21 May 2007, alongside the Planning White Paper: Planning for a Sustainable Future
To seek comments on the Government's preliminary view that private sector companies should be allowed the option of investing in new nuclear power stations in the UK because of their potential contribution to the UK's goals on climate change and security of supply.	23 May 2007, alongside the Energy White Paper
To set out the arrangements we propose for strengthening and modifying the Renewables Obligation, including the implementation of banding.	23 May 2007, alongside the Energy White Paper
This consultation is part of our comprehensive package of short-term and long-term measures to improve energy planning for Major Infrastructure Projects.	23 May 2007, alongside the Energy White Paper
To consult on key issues such as the size of the commitment under this obligation on suppliers between 2008 and 2011.	23 May 2007, alongside the Energy White Paper
To consult on our evidence and analysis of how markets for domestic consumer electronics could develop, together with proposed sales targets and performance standards for the next 10-20 years.	23 May 2007, alongside the Energy White Paper
To consult on strengthening the statutory decommissioning regimes for oil and gas and renewable energy installations, to minimise the risk of liabilities falling on the public purse in the event of operator default.	June 2007
To help consider possible alternative designs for the post 2011 phase of the continuing obligation on energy suppliers.	Summer 2007
To consult on the detailed design of the Carbon Performance Commitment on large non-energy intensive organisations.	Summer 2007
To update the electricity priority user arrangements in the extremely unlikely event of a widespread electricity disruption.	Summer 2007
To consult on the Government's proposals for implementing CoRWM's recommendations.	Summer 2007
To consult on possible additional measures needed to comply with the Energy Services Directive 2006/32/EC Article 6 in relation to the promotion of energy efficiency by energy suppliers.	Summer 2007
To consult, as appropriate, on the billing and metering proposals set out in this White Paper.	Summer 2007
DTI / Ofgem to consult jointly on more flexible market and licensing arrangements for distributed, low carbon electricity supply.	Autumn 2007
To consult on regulation for the full chain of CCS technologies.	Later in 2007
To consult on options for mandatory new car fuel efficiency targets, along with other details of the European Commission's communication on carbon dioxide from passenger cars and light commercial vehicles.	Later in 2007
To consult on whether all new homes should be required to be rated against the Code.	By the end of 2007

Consultations announced in, or related to, the 2006 Energy Review Report: *The Energy Challenge*

Title	Purpose
New nuclear policy framework	To set out how the Government intended to create a policy framework under which developers could make proposals for new nuclear build, and seek views on the proposals for the framework.
The Energy Efficiency Commitment April 2008 to March 2011: initial consultation	To gain early views on the shape of the EEC3 (2008-2011) in advance of the statutory consultation in 2007.
Reform of the Renewables Obligation and statutory consultation on the Renewables Obligation Order 2007	To seek views on the proposals for changes to the Renewables Obligation set out in the 2006 Energy Review Report. In addition the consultation document contained proposals for a small number of more limited and detailed changes to the Renewables Obligation legislation.
The effectiveness of current gas security of supply arrangements	To seek the views of industry and consumers on the effectiveness of current gas security of supply arrangements.
Measures to reduce carbon emissions in large non-energy intensive business and public sector organisations	To gain views on a range of options for achieving emissions savings in large non-energy intensive organisations of 1.2 million tonnes of carbon per year by 2020.
Updating the electricity generating stations and overhead lines inquiry procedure rules in England and Wales	To consult on the proposed new inquiry rules for applications under the Electricity Act, including the partial regulatory impact assessment, and the accompanying draft guidance for participants.
Energy billing and metering	To consider proposals made in the Energy Review on how metering and billing might help reduce energy consumption.
Offshore Natural Gas Storage and Liquefied Natural Gas (LNG) Import Facilities	To gain views on proposals to establish a clear regulatory framework for the offshore storage of natural gas in non-hydrocarbon features such as salt caverns, as well as in partially depleted oil and gas fields, and for the offshore unloading of LNG .
Resilience of overhead power line networks	The Energy Review Report underlined that an important factor in the reliability of our energy supplies is the resilience of the electricity networks. As a consequence Government reviewed the overhead lines regime and concluded a better balance could be struck between changes for which the full consent process is required, and changes where a more flexible approach could be adopted.
Guidance on the consenting process for onshore generating stations above 50 MW in England and Wales	To consult on consents guidance for onshore generating stations above 50 MW.



Duration	Weblink
11 July – 31 October 2006	http://www.dti.gov.uk/energy/review/implementation/nuclear-framework/page31831.html
31 July – 23 October 2006	http://www.defra.gov.uk/corporate/consult/eec3/index.htm
9 October – 15 December 2006 (part 2) and 5 January 2007 (part 1)	http://www.dti.gov.uk/energy/review/implementation/renewables-obligation/page34483.html
16 October 2006 – 12 January 2007	http://www.dti.gov.uk/energy/review/implementation/gas-supply/page34654.html
8 November 2006 – 31 January 2007	http://www.defra.gov.uk/corporate/consult/carbon-emissions/index.htm
9 November 2006 – 1 February 2007	http://www.dti.gov.uk/energy/review/implementation/electricity-act-inquiry/page35205.html
14 November 2006 – 6 February 2007	http://www.dti.gov.uk/energy/review/implementation/billing-metering/page35269.html
24 November 2006 – 16 February 2007	http://www.dti.gov.uk/energy/review/implementation/gas-storage/page35616.html
18 December 2006 – 14 March 2007	http://www.dti.gov.uk/energy/review/implementation/overhead-resilience/page36117.html
11 May 2007 – 3 August 2007	http://www.dti.gov.uk/energy/review/implementation/consenting-process/page39394.html

Printed in the UK for The Stationery Office Limited
on behalf of the Controller of Her Majesty's Stationery Office
ID5539714 05/07

Printed on Paper containing 75% fibre content minimum.



Published by TSO (The Stationery Office) and available from:

Online

www.tsoshop.co.uk

Mail, Telephone, Fax & E-mail

TSO

PO Box 29, Norwich NR3 1GN

Telephone orders/General enquiries 0870 600 5522

Order through the Parliamentary Hotline Lo-call 0845 7 023474

Fax orders 0870 600 5533

Email book.orders@tso.co.uk

Textphone 0870 240 3701

TSO Shops

123 Kingsway, London WC2B 6PQ

020 7242 6393 Fax 020 7242 6394

16 Arthur Street, Belfast BT1 4GD

028 9023 8451 Fax 028 9023 5401

71 Lothian Road, Edinburgh EH3 9AZ

0870 606 5566 Fax 0870 606 5588

TSO@Blackwell and other Accredited Agents

ISBN 978-0-10-171242-2



9 780101 712422