



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

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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.