HM Government

Policy Review

Building on progress: Energy and environment

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We have it in our power to change the future. It is time to act.

Foreword by the Prime Minister

Since the industrial revolution, we have seen changes in the global temperature unprecedented in human civilisation, caused by the burning of fossil fuels and deforestation. We also now face a serious challenge in securing our energy supplies. We have gone from a situation where we were 80% self-sufficient to one where we will be importing almost all our gas and more than half our oil by 2020.

The Stern Review showed that, without concerted action, the impact of climate change will be equivalent to a loss in world GDP of at least 5% each year and potentially as much as 20%. Business as usual will lead to devastating humanitarian, environmental and financial consequences. Developing countries will face the threat of droughts, famines, water shortages and conflict over increasingly scarce resources.

We have made a lot of progress over the last ten years. The UK Government has been centrally involved in many of the major global and European policy initiatives. We have also made great progress in decoupling resource consumption from economic growth in the UK.

The Climate Change Bill is the beginning of a fundamentally new approach for the UK in tackling climate change. The Bill proposes binding legal commitments to reduce carbon dioxide (CO_2) emissions by 60% below 1990 levels by 2050, and by between 26% and 32% by 2020. Government will be held to account through five-year carbon budgets, and by independent annual reporting against progress in Parliament.

This paper sets out the approach that we will now follow in tackling the biggest challenge of our times. There are three principles in particular that will underpin the Government's response.

First, tackling climate change should not be seen as an attack on living standards. The choice is not between growth or no growth – it is between high carbon growth and low carbon growth. Only if we acknowledge this can we hope to persuade other countries such as the US, China and India to commit unequivocally to global environmental goals. The development of technological answers is critical. Investment in low carbon technologies

offers the best opportunity for meeting our long-term carbon targets, raising our standards of living and convincing other countries to reduce their emissions too.

That is not to say that there is not much we can do right now to curb emissions. Electricity, heat and transport account for the majority of UK greenhouse gas emissions. In each, it is possible to achieve the same level of light, heat and mobility while cutting or even eliminating carbon emissions. Homes, appliances and cars can become much more energy efficient, and they can be powered by low carbon energy sources. And individuals can make simple changes to their everyday behaviours to lower their personal CO_2 footprint – for instance by replacing standard light bulbs with low energy ones, or by turning the thermostat down one degree.

We can build coal and gas-fired power stations fitted with carbon capture and storage which have the potential to cut emissions by around 90%. Renewable electricity from wind, wave and solar power could supply up to a fifth of our electricity by 2020. Nuclear power is also low carbon. We can design homes that minimise the need for heating, and use the waste heat generated from electricity. We can use more biofuels and hybrid cars, and in the long term electric cars and hydrogen fuel cells are a possibility. A cut in CO_2 emissions of at least 60% by 2050 is achievable, but only if we embrace low carbon technologies and take tough decisions – for example, building wind farms to create new generating capacity – and give serious consideration to nuclear power.

Second, we need to strike the right balance between the state, market mechanisms and individual and community action. The solution lies not in any one by itself, but in the right combination. Carbon cap-and-trade, for example, is a very sophisticated mechanism because it guarantees achieving the outcome while allowing maximum flexibility. But this must be supported by an active state. Behaviour is driven by a number of factors, not just by financial costs and benefits. The state has to provide additional incentives, regulation and information. Leaving it all to a vague notion of social responsibility will not reduce emissions.

Third, we need to act in concert with others. The problems cannot be solved at the level of the nation state.

Our power to shape an international framework relies on our ability to maintain our strong relationship with the US, and our commitment to participate fully in Europe. This includes adopting ambitious EU-wide targets, and participating in EU initiatives such as the EU Emissions Trading Scheme (ETS).

By forming a single negotiating block, the EU will be influential in forging a

post-2012 framework. As the largest single market in the world, it has the critical mass to drive the transformation of markets in cars and appliances through regulation. By introducing carbon pricing at a European level, UK businesses are not disadvantaged in competition with other firms in Europe. By making a commitment to reduce emissions by 20% by 2020, and by 30% if other developed nations make comparable reductions, Europe is demonstrating to developing nations that industrialised countries are prepared to take their fair share of responsibility.

Climate change is the greatest economic, environmental and humanitarian risk facing all of us. It will require the greatest of efforts from all parts of society if we are to avoid it. But we can be optimistic. It can be done, and this paper shows us how.

The scientific advice is clear – human activity is altering our climate. The economic advice is also clear – the benefits of strong, early action considerably outweigh the costs.

Introduction and summary

The UK has the world's fifth largest economy. Over the past ten years it has enjoyed an unprecedented period of continuous growth and high levels of employment. It can face the future of an ever more globalised, knowledge-driven world economy with confidence.

But the origin of the energy on which our economy operates is changing. By 2020, the UK will be importing the majority of its gas and more than half its oil. Like other major energy-using countries, the UK is set to become more dependent on a small number of suppliers in less stable parts of the world.

At the same time, much of our energy infrastructure is due for renewal. Around a third of the country's electricity generation capacity will need to be replaced by 2025 and a third of the coal-fired capacity is due to be retired by 2016. A strong flow of new investment is needed to secure the reliability and sufficiency of electricity and gas supplies.

And it is increasingly apparent that there is an extra cost to the exploitation of fossil fuels and natural resources and the changes in land use from which much of the global economy has drawn its income. The scientific advice is clear – human activity is altering our climate and, with it, the systems that support life on Earth.

These are challenges common to many nations. Energy security and climate change are issues of national and collective security. Each involves market failures that require the effective intervention and attention of governments. Both beckon a new, low carbon economy that offers a more stable, less carbon-dependent future and relief from the worst effects of climate change.

The future will see the UK much more efficient in its use of energy, and with greenhouse gas emissions at a fraction of those today. It will be a country that draws on a mix of low carbon energy sources, uses natural resources much more efficiently, and sits at the heart of a low

Around a third of the country's electricity generation capacity will need to be replaced by 2025.

Large markets for ultra-efficient products and clean energy services can be expected to develop.

carbon world economy that has reconciled continuous improvements in wellbeing with sustainable use of the natural environment.

It will also be an economy of opportunity, embracing new technologies and providing new types of employment. Large markets for ultra-efficient products and clean energy services can be expected. The International Energy Agency has estimated that global investment in energy infrastructure will total $20 trillion dollars to 2030.[1] Even more investment will be needed if this energy infrastructure is to be low carbon infrastructure.

When future generations look back to our time they must not find us wanting for effort or application. We understand the threats we face; we are well placed to take advantage of new opportunities; and we have it in our power to change the future. It is time to act.

The UK Government is committed to both domestic and international action to meet these challenges and to help the UK grasp the opportunities on offer. The Government's vision is to see the UK secure as a productive and successful low carbon economy in a world on the path to sustainable development. To guide the UK towards that vision, the Government has put in place a credible and consistent policy framework whose key elements are:

- promoting competitive energy markets;
- working towards a robust post-2012 international framework, in the context of an EU goal to limit climate change to no more than 2° Celsius (C) above pre-industrial levels;
- putting a price on carbon that reflects its damage costs, and which encourages the shift to a low carbon economy;
- driving the transition to new technologies through standards, incentives and support for basic research and development;
- removing the barriers to change in behaviours, choice and investment; and
- ensuring that the UK and others are able to adapt to the impacts of climate change.

This paper describes the twin challenges of energy security and climate change (Chapter 1), provides a vision for the low carbon economy (Chapter 2), and spells out how the above policy framework is being applied. It explains what is required at each level, from the individual to the international, gives examples of the measures the Government has put in place, and outlines the future direction of policy.[2] The discussion focuses particularly on climate change; the Government's

energy policy and its response to the energy security challenge is covered in detail in the recently published Energy White Paper, *Meeting the Energy Challenge*.

Chapter 3 explains that personal action can make a difference. Individuals are responsible for around 40% of the UK's CO_2 emissions. Simple changes in behaviour and choices can save money and carbon, and help to shift markets. The Government aims to enable and support individuals to make more sustainable choices through advice, information, incentives and improving product standards.

Cutting the carbon emissions of our towns, cities and transport systems is a key issue. We are a highly mobile but heavily urbanised society. Chapter 4 shows how the design of truly sustainable cities and low carbon national transport systems are challenges for which there are no off-the-shelf solutions.

Chapter 5 sets out the role of business in the transition – both cutting its own emissions and delivering the products and services that will define the low carbon economy. The transition will open up new opportunities for wealth creation and employment. There is a key role for government in creating a stable and supportive policy framework for investment in the development, demonstration and deployment of low carbon technologies, including an efficient global carbon market.

Chapter 6 describes how, at a national level, the Government has been proactive in integrating the UK's climate and energy security strategies. It is seeking to set a demanding long-term CO_2 emissions target in law, together with the mechanisms to ensure that the target is met. It has brought forward a series of measures to strengthen energy security and encourage investment in new infrastructure that meets the UK's long-term needs. And it is redoubling efforts to improve the sustainability of its own performance. This includes moving to a situation where public procurement – currently around £150 billion per year – is low carbon, low waste, water efficient, respects biodiversity and helps to deliver the Government's sustainable development objectives.

We need to adapt to the impacts of climate change at the same time as we act against its causes. As noted by the most recent reports from the Inter-governmental Panel on Climate Change, the effects of climate change are already being experienced, and the inertia in the climate system means that those effects will continue for decades even if action is taken now. The Government is supporting the adaptation process here in the UK and overseas.

Many of the standards, incentives and policies needed to support the UK's energy

security and climate change objectives are most sensibly set at European level, not least because this helps to minimise impacts on UK competitiveness. Chapter 7 explains how the UK has been a leading advocate of reforms to the EU's energy markets and of an integrated EU strategy for energy security and climate change. The UK must maintain a positive and proactive relationship with other Member States and the European Commission to deliver the solutions that are best for the UK.

A strong post-2012 agreement on global greenhouse gas emissions, under the UN Framework Convention on Climate Change, is urgently needed. Only global action, based on the principle of common but differentiated responsibilities and respective capabilities, can liberate the UK and the rest of the international community from the threat posed by climate change. Chapter 8 explains how the UK will continue to play a leading role in the negotiation process and in the international dialogue on climate change and energy issues in forums such as the G8, the Gleneagles Dialogue and the International Energy Agency, and through its bilateral relationships with developed and developing nations.

The element common to both the energy security and climate change threats is the need for early and sustained action.

1. Energy security and climate change: The twin challenges

Energy security cannot be taken for granted

1.1 Reliable, affordable energy underpins today's economy and the lifestyles it supports. It is easily taken for granted. We can plug in or switch on without giving thought to how our electricity was generated, where the gas that heats our homes was sourced, or how the petrol that fuels our car reached the pump.

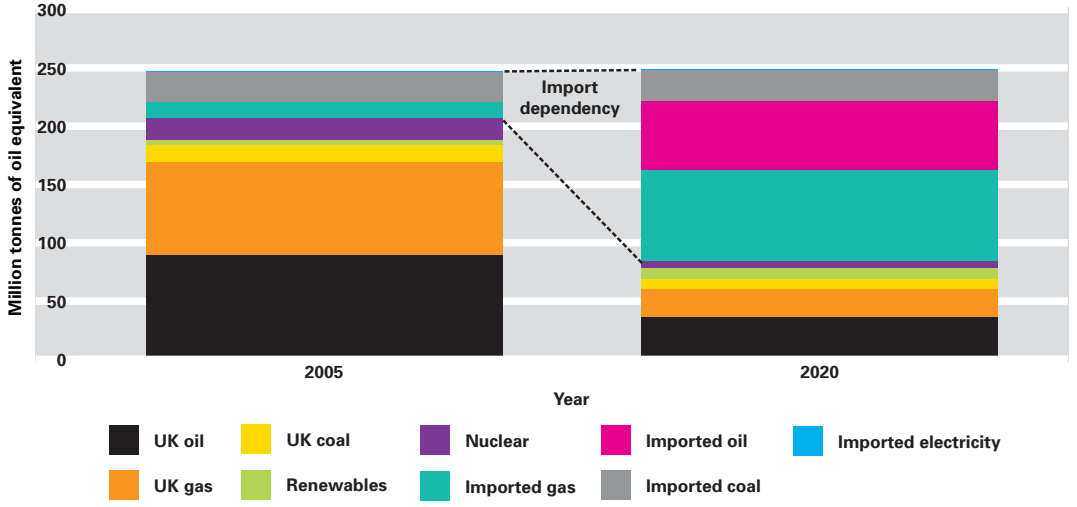
1.2 For the last 30 years or so, UK energy security has been largely guaranteed by the reserves of oil and gas in the North Sea. These have kept the UK almost self-sufficient in oil and gas. But finding and exploiting new reserves is becoming more challenging and costly. Output from the North Sea is set for long-term decline.

1.3 The UK's dependence on imported oil and gas supplies will therefore increase over time. By 2020, we could be importing around 60% of the gas we use and up to two-thirds of the oil (see Figure 1).[3] The change will influence the structure of UK trade, and also leave it more exposed to international events over which it has little control. With energy supply more dependent on a smaller number of providers in less stable regions of the world, the country may face new levels of supply risk and uncertainty. It needs to understand and manage its exposure.

1.4 The UK is not alone in facing an increased dependency on energy imports. Many of the world's largest energy-consuming countries are set to become much more reliant on a more concentrated set of suppliers in the Middle East, Russia, Central Asia and Africa.

1.5 And, at the same time, the UK needs substantial, and timely, private sector investment in new gas import infrastructure and storage, and in electricity generation, to replace retiring power stations and ageing transmission and distribution networks. Around a third of the UK's entire electricity generation capacity will need to be replaced by 2020, including about 8 Gigawatts of existing coal-fired capacity that is likely to close before 2016.

Figure 1: The UK could be importing around two-thirds of its energy by 2020



Source: DTI, 2007

The case for urgent action on climate change is now irrefutable

1.6 The UK and the world community are engaging in parallel with the issues raised by the threat of climate change. The scientific advice is clear and unambiguous: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures".[4] The economic advice makes the case for prompt action: "the benefits of strong, early action considerably outweigh the costs".[5]

1.7 Climate change is itself a security issue. It is a direct threat to the lives and livelihoods of people across much of the globe: if left unchecked, the numbers of additional people at risk of hunger could reach 600 million globally by 2080.[6] It is already impacting on ecosystems and the services they provide. It could destabilise international relations and exacerbate resource conflicts in some of the most vulnerable parts of the world.

1.8 We should be as concerned by what existing science cannot tell us as by what it can. The direction of change is clear, but there remains significant uncertainty about exactly how far and how fast climate systems will respond to our continued injection of additional carbon into the atmosphere. At a regional and global level there is a risk of consequences well beyond the central estimates of expected impact.

Climate change is itself a security issue. It is a direct threat to the livelihoods of people across much of the globe.

1.9 A 2°C temperature rise above pre-industrial levels, while avoiding the worst dangers of climate change, will still have serious impacts for both the UK and the rest of the world. Even a 1°C rise could see 18–60 million additional people at risk of hunger and up to 1,600 million additional people suffering water stress.[7] And 20–30% of species assessed so far are likely to be at risk of extinction if the average global temperature increases by 1.5–2.5°C.[8]

1.10 The forces of increasing prosperity and population that are propelling global greenhouse gas emissions ever higher are powerful and persistent. The International Energy Agency's reference scenario shows global fossil fuel CO_2 emissions rising 55% from 2004 levels by 2030, to 40 billion tonnes CO_2 per year,[9] if no action is taken to mitigate emissions – and by around 31% if planned policies and measures are put in place. Primary energy demand is projected to increase more than 50% over the same period.

1.11 The element common to both the energy security and climate change threats is the need for early and sustained action:

- The EU's goal is to limit the average change in global temperature to no more than 2°C above pre-industrial levels. If this is to happen, total carbon emissions need to peak in the next 10–15 years and then start declining. This requires a huge shift in investment, technologies, markets, policies and attitudes.
- If new investment does not materialise, the reliability of electricity and gas supplies cannot be guaranteed beyond the middle of the next decade. The timing of the electricity industry's investments, and the technologies that are used, will determine security of supply and energy dependency, and shape carbon emissions, for decades to come. The UK's increasing import dependency creates new risks to be managed, and reinforces the need for a diversity of fuels as well as a diversity of suppliers.

1.12 The UK Government has been proactive in responding to these twin challenges. In November 2005, the Government began a review of energy policies in response to new information about the UK's increasing energy dependency, about climate change and in light of trends in EU energy markets. The 2000 Climate Change Programme was updated and extended in 2006, focusing on the delivery of the UK's Kyoto target[10] and making progress towards its domestic CO_2 targets. The draft Climate Change Bill, published in March this year, sets out

a framework for moving the UK to a low carbon economy by including a series of clear targets for reducing CO_2 emissions and introducing a new system of legally binding, five-year 'carbon budgets'. An adaptation strategy to help the UK understand and manage the impacts of climate change is in development.

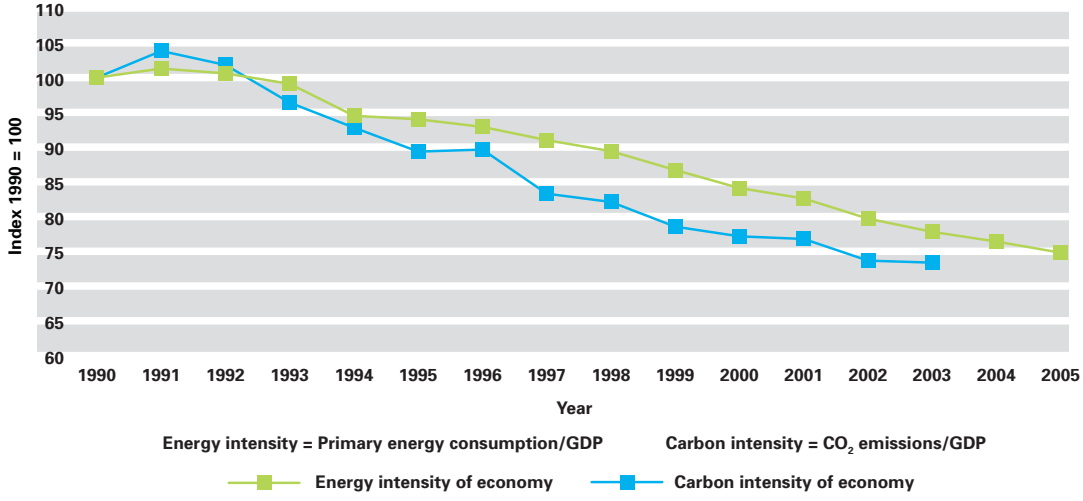
1.13 The Energy White Paper makes clear that there is no single solution to the energy security and climate challenges that the UK now faces. We need to improve the energy efficiency of our buildings, products and transport. We need to take the carbon out of the UK's energy supply – moving faster and further to low carbon sources. And we need a diversity of energy sources to improve the UK's resilience to external supply shocks. In short, we need to move to a 'low carbon economy'.

The carbon intensity of the economy fell 27% between 1990 and 2003.

1.14 The UK is already on this path: the energy intensity of the economy fell 25% between 1990 and 2005, and the carbon intensity of the economy fell 27% between 1990 and 2003 (see Figure 2).[11] UK emissions of greenhouse gases have fallen 15% since 1990.

1.15 But further reductions of the scale delivered by the changes of the past 20 years in industrial processes and the shift from coal to gas in electricity generation will not be easy. When expected growth

Figure 2: Index of the carbon and energy intensity of the UK economy, 1990–2005



Source: DTI (energy intensity) and World Resource Institute CAIT (carbon intensity)

of the economy is factored in, the rate of reduction in the carbon intensity of GDP needed to meet the UK's 2050 target is highly demanding. The UK needs to go much further to achieve its long-term carbon target, make its contribution to addressing the causes and impacts of climate change, and help catalyse action elsewhere through its political and practical leadership.

1.16 This transition is set in the context of wider changes in the economy and society, including:

- the continuing evolution of a **service-dominated, knowledge-driven economy** that values skills and flexibility;
- the **globalisation of markets and trade** in which ever larger numbers of people are being drawn into the global labour market, and low cost communication and transport create new competitive pressures and opportunities; and
- **demographic trends**, including population growth and more single-person households, that create additional demand for housing, infrastructure and the servicing of basic needs. This demand, in turn, leads to additional pressure on resources and greater emissions that must be accommodated within a diminishing carbon budget, here in the UK and globally.

1.17 The scale of the challenges ahead should not be understated, but the benefits are clear. A world less dependent on oil and gas is likely to be more stable. A world of lower carbon emissions is one less exposed to the risks and consequences of climate change. There will be important, nearer-term benefits such as cuts in the health and other costs associated with air pollution, more liveable cities, and habitat and biodiversity conservation. And the transition will provide new opportunities for UK businesses and financial markets.

A world less dependent on oil and gas is likely to be more stable. A world of lower carbon emissions is one less exposed to the risks and consequences of climate change.

The Government's long-term vision is to see the UK secure as a productive and successful low carbon economy in a world on the path to sustainable development.

2. A vision for a low carbon economy

2.1 In the last ten years the Government has helped to deliver a competitive, high employment, service-led UK economy in which strong and stable economic growth has been combined with improvement in many aggregate measures of environmental and energy performance.

2.2 Now, faced with the threat of climate change and growing energy security risks, it is clear that the UK must take radical measures to further reduce its carbon dependence. We need to be part of something new – a low carbon world economy.

The Government's long-term vision is to see the UK secure as a productive and successful low carbon economy in a world on the path to sustainable development

2.3 There should be continued improvements in standards of living and economic progress. But every sector of the economy will have to become more energy efficient, and use low carbon energy sources. The ultimate destination is a society of zero carbon power, heat and transport.

2.4 The transition to a low carbon economy has been likened to the industrial revolution.[12] The scale of the transition required cannot be understated. If the UK is to meet its national carbon reduction targets and enjoy its current rate of economic growth, major reductions in both the energy intensity of GDP and the carbon intensity of energy supply will be required.

2.5 In many ways, a low carbon world need not 'look' very much different – the sources of low carbon electricity or renewable fuel may be no more visible to the average consumer than today's power stations or oilfields. But beneath the surface, energy use will be more intelligent and efficient. Energy systems will be closely integrated with the design of infrastructure, buildings and products. Goods and services will require smaller inputs of resource than they do today.

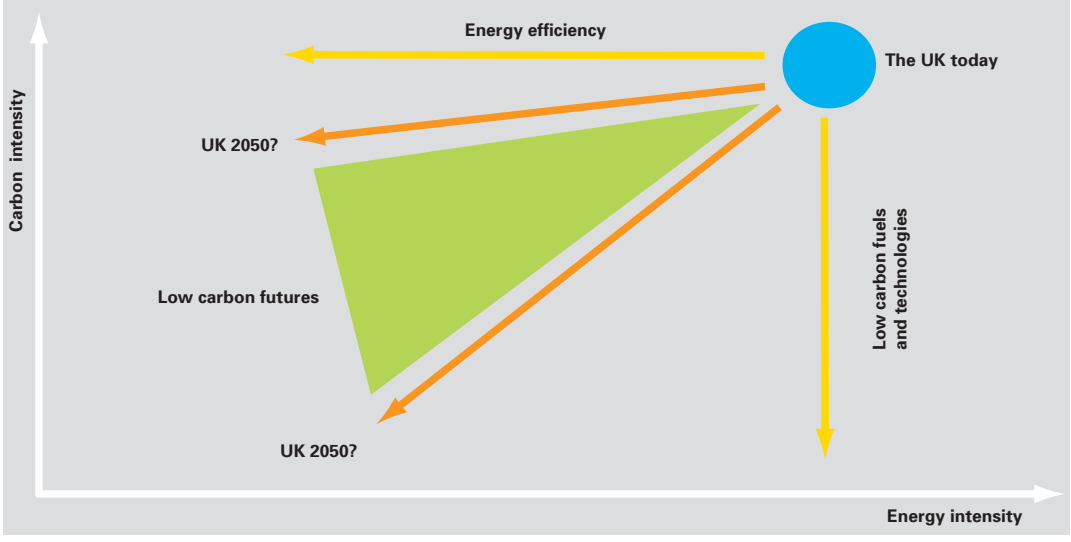
2.6 As with the IT revolution of recent decades, the transition will see the

emergence of new kinds of technology leading to changes in behaviour and lifestyles. It will stimulate new business models, products and services. It will drive the creation of new types of job and changes to patterns of employment.

2.7 Investing now will be much cheaper than the consequences of inaction. The Stern Review estimated the costs of unabated climate change to be equivalent to an average reduction in global GDP per capita consumption of 5%, now and for ever, and potentially as much as 20%. In contrast, and albeit with uncertainties, modelling work carried out for the Energy White Paper estimated that the annual costs to the economy of reducing UK carbon emissions by some 60% by 2050 are between 0.3 and 1.5% of UK GDP in 2050. Costs could be even lower if some of the UK's abatement can take place abroad.[13]

2.8 There is no single technology or energy pathway to the UK's 2050 CO_2 emissions target and a low carbon economy – no pre-destined low carbon future (see Figure 3). There are instead multiple, complementary ways to meet the challenge (see Box 1). Their impacts on the different dimensions of energy security vary: some affect both energy consumption and carbon emissions; others decouple carbon emissions from energy use. Each has a role. Their relative contribution will depend

Figure 3: There are many pathways to a low carbon economy



Source: Adapted from M. Grubb, *Climate, energy and innovation*, 2004

Box 1: Complementary strategies for reducing energy and carbon dependency

Reducing energy demand – Behavioural changes can cut energy use and carbon emissions. Examples include changes in energy use at work and at home (adjusting thermostats, turning off lights and appliances not in use) and changing patterns of transport use (encouraging more sustainable transport choices such as using public transport, and walking and cycling more).

Improving energy efficiency – Technological improvements can increase the efficiency of power plants and energy-using equipment such as appliances, vehicles, lighting and buildings.

Switching to less carbon-intensive fossil fuels – Switching from carbon-intensive fossil fuels (such as coal without carbon capture) to less carbon-intensive fuels (such as gas) cuts emissions per unit of energy generated.

Switching to emission-free energy sources – Greenhouse gas emissions from nuclear and renewable energy sources, such as wind and solar, are negligible (though there are some life cycle impacts from construction, nuclear fuel processing, etc).

Capturing and storing CO_2 – Carbon is captured before or after the combustion of fossil fuels and stored in onshore or sub-seabed geological formations such as oil and gas fields and saline aquifers (natural underground reservoirs).

Reducing non-energy greenhouse gas emissions – Land use changes, agriculture and waste are significant sources of carbon and other greenhouse gas emissions. The effect of deforestation alone is equivalent to global carbon emissions from transport. Better land management, forest protection, changes to agricultural practice and improved waste management can reduce emissions.

Source: Adapted from IEA, *Energy security and climate policy*, 2007

on the interplay of markets, rates of innovation, investment, public policy and consumer choice.[14]

2.9 Government's primary role in meeting the vision is to create a credible and consistent framework that guides low carbon choices and investment. Government should guide action, but not prescribe the precise solutions. It should harness the power of competitive markets to innovate and find these solutions in the most efficient way, while recognising that additional incentives, regulation and information may at times be needed.

2.10 Putting a price on carbon that is equivalent to the damage it causes to the environment and society is a necessary step, and is achievable through emissions trading, taxation or regulation.[15] But it is often not sufficient, because market failures and behavioural barriers stand in the way of change. So additional policies may be needed to increase the pace and scale of the technology transition, and to help overcome barriers to change. And government needs to enable and engage with individuals, communities and businesses to secure their active support in the transition. Achieving full transition will take time. Advances will be made step-by-step, with each innovation and each low carbon investment.

2.11 Carbon emissions are predominantly driven by infrastructure – in power

Putting a price on carbon that is equivalent to the damage it causes to the environment and society is a necessary step.

generation and distribution, transport and buildings – which has a long lifespan and slow turnover. This means that decisions and investments made in the coming decade may lock us into emission pathways that are hard to reverse so, as far as possible, they need to be 'future-proofed' against expectations of what policies and prices might be in the years ahead. Uncertainty about future international frameworks on climate change and future carbon prices makes this difficult. So the Government needs to pay close attention to the development of the UK's energy infrastructure and should work to reduce the uncertainties that it can influence.

2.12 The UK needs to maintain a diversity of energy supplies to increase its resilience in the face of future supply risks and required reductions in carbon emissions. In electricity this means a mix of different types of power generation – such as household 'micro-generation', community combined heat and power, as well as large power stations. It also means a mix of technologies: making the most of renewable energy, extracting energy from the waste we cannot recycle, exploiting opportunities for combined heat and power, using clean fossil fuel technologies

and looking at an ongoing role for nuclear power.

2.13 Box 2 illustrates the sort of changes that might take place in the sectors that account for the vast majority of UK emissions: electricity, heat and transport.

2.14 The UK has some of the richest renewable resources in Europe, particularly its wind and marine (wave and tidal) resources. If they can be captured effectively and at the right cost, they can make a significant contribution to our long-term low carbon electricity needs.

2.15 And it is increasingly clear that local energy supply, ranging from household solar water heating to community-scale combined heat and power, could play an important part in our strategy to reduce carbon emissions. The Government wants to provide opportunities for distributed energy. The Energy White Paper includes a package of measures to remove barriers and encourage more widespread deployment of distributed energy schemes.

2.16 Nuclear power currently accounts for almost 20% of our electricity generation and 7.5% of our energy supplies. It is a low carbon source of supply. But most of the existing stations are due to be phased out in the next 15 years or so. Subject

Box 2: Transitions in electricity, heat and transport on the road to a low carbon economy

ELECTRICITY	
High carbon economy	**Low carbon economy**
Most electricity comes from fossil fuels such as coal and gas	Electricity comes from low carbon sources: for example renewables (such as wind, wave and tidal); coal-fired and gas-fired power stations that have carbon capture and storage; and nuclear power
Products are energy inefficient	Products are made lighter, more energy efficient, and easier to recycle
Energy suppliers profit from supplying as much electricity as possible	Energy suppliers profit from delivering services (for example 'light'), which may be by responding to demand, but also by helping consumers reduce their energy use, or installing micro-generation
Most consumers do not improve their energy efficiency because of a lack of information, upfront costs, and inconvenience	Most consumers get a home energy audit, and have access to companies that can provide a hassle-free renovation service where they buy now, but pay later as their energy bills come down

HEAT	
High carbon economy	**Low carbon economy**
Many existing homes are draughty and waste energy	All new homes are built to require far less or no heating because of insulation, better design and micro- and community-scale generation
Most homeowners do not invest enough in insulation even though it will save them money	All homeowners have access to a hassle-free service to reduce their energy demand and invest in insulation
Heat generated for other processing, including for electricity, is wasted	Waste heat is used through 'combined heat and power' technologies
Heat is generated from burning oil, coal and gas	Heat is generated from low carbon fuels and technologies, for example biomass and waste
TRANSPORT	
High carbon economy	**Low carbon economy**
Most cars are powered by fossil fuel	Vehicles are more fuel efficient, and use low carbon fuels – initially biofuels, and also, in the long term, electric power or hydrogen fuel cells
Fuel suppliers focus on petrol and diesel	Fuel suppliers create an infrastructure to support biofuels or other types of fuel and engine
Car use increases as incomes rise and fuel efficiency improves	People make more sustainable transport choices, including greater use of public transport, walking and cycling
Consumers buy cars with a high environmental footprint	Consumers are aware of the environmental footprint of cars, and take greater account of this in their purchasing decisions

Source: Defra, *UK climate change strategic framework*, 2007

to the further consultation launched with the Energy White Paper, the preliminary view of the Government is that it would be in the public interest to give energy companies the option of investing in new nuclear power stations. It could make important contributions to reducing carbon emissions and to the reliability of energy supplies. But it would be for energy companies to come forward with proposals for new nuclear power stations and to be responsible for their design, building, financing and operation.

2.17 In the longer term, it is possible to see hydrogen emerging as a key energy carrier in transport and also having a role in heating. The UK should continue to support and be involved in the research, development and demonstration of

hydrogen-based technologies, and develop a better understanding of their implications for national energy infrastructure.

2.18 In some areas, such as aviation, there is no low carbon alternative to fossil fuels currently in prospect. With its industrial expertise in aviation and aviation design, the UK is well placed to contribute to the coordinated international effort that will be needed to develop new solutions.

2.19 Using energy more efficiently, making the most of the energy opportunities here in the UK, and moving to new low carbon technologies will serve our energy security and climate change objectives. It must be a collective effort. Individuals, communities and civil society, business and government need to join together to reduce the carbon dependency of our economy. Nation states, in Europe and globally, need to engage in collective action to mitigate and adapt to the impacts of climate change and to ensure energy security.

We can all make simple, affordable changes to reduce emissions significantly – without necessarily affecting our standard of living.

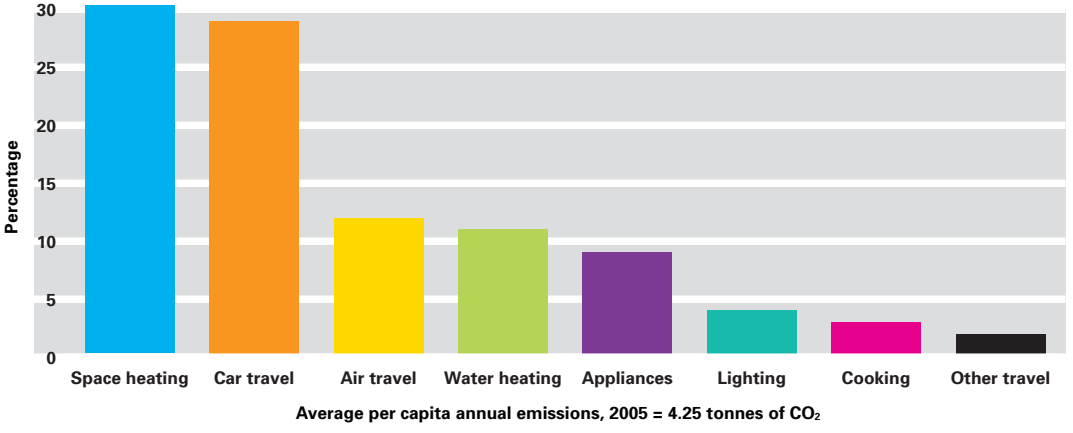
3. Role of individuals

Individual action can make a difference to the UK's greenhouse gas emissions

3.1 The choices we make about how we travel, what we buy and how we use energy at home all have a direct or indirect CO_2 impact (see Figure 4). Some 40% of the UK's CO_2 emissions arise directly from individuals going about their day-to-day lives.[16] This amounts to an average of about 4.25 tonnes of CO_2 per person each year.

3.2 Simple, affordable changes can reduce these emissions significantly (see Box 3). There are many 'quick wins' which are neither difficult nor demanding, and which also save money. Lower energy consumption generally means both lower CO_2 emissions and less expense on electricity, gas and fuel.[17] Other simple adjustments to shopping habits, recycling and water use can have a measurable impact on household consumption of natural resources.

Figure 4: Heating and travel provide the largest contribution to the average individual's annual CO_2 emissions



Source: Defra analysis, 2006

Box 3: Simple steps towards saving a tonne of CO_2 emissions

Wash clothes at 30°C
Turn all appliances off standby
Drive a more fuel-efficient car and drive in a more economical manner
Boil only the water you need in the kettle
Turn off the lights when you leave the room
When replacing an old appliance, consider replacing it with an 'Energy Saving Recommended' one
Install full loft insulation or top up your existing insulation
Turn your thermostat down by one degree
Install solar water heating
Insulate cavity walls, where possible
Replace traditional light bulbs with low energy ones
Replace your old boiler with a high efficiency condensing one

Source: Adapted from www.together.com

3.3 So personal choices do matter. The cumulative impact of individual actions on the UK's total CO_2 emissions could be huge. Acting more sustainably should not mean sacrificing quality of life or the country's prospects for continued economic development. But selecting a more sustainable, low carbon option sends a signal to retailers, service providers, manufacturers and those around us about the values that we as individuals hold and support. These signals, when combined, can change social attitudes and can shift markets – supporting the companies that are coming forward with new, more efficient, products and services.

The Government's role is to enable people to make sustainable choices

3.4 The collective action of citizens, supported by the efforts of business and the Government, will help drive the transition to a low carbon economy.

Simple adjustments to shopping habits, recycling and water use can have a measurable impact on household consumption of natural resources.

But surveys suggest that at present many people are aware of environmental problems but not the solutions.[18] The Government's role includes raising awareness, removing barriers and enabling new technologies so that individuals are encouraged and enabled to make more sustainable choices.

3.5 This means policies that focus on:

- ensuring that information is available to consumers to help them make informed choices, through labelling, meters and advisory services;
- fostering a culture of 'CO_2 literacy' in which individuals understand their CO_2 impact and take responsibility for minimising it;
- making low carbon options more accessible by tackling market failures and, where appropriate, introducing incentives to make energy-efficient, low carbon options more financially attractive; and
- working with business to ensure that the efficiency of all products on the market continues to improve, and to deliver the transformational technologies, such as advanced biofuels, that will help people maintain their current lifestyles while emitting less CO_2.[19]

Progress is being made through a mix of support, advice, investment, incentives and an improvement in standards

3.6 Over the past ten years, the Government has made significant progress in helping to improve the energy performance of homes and appliances, working to reduce fuel poverty as well as CO_2 emissions.

3.7 The Energy Saving Trust (EST) promotes the most efficient use of energy to householders and communities.[20] Through schemes such as its 'Energy Saving Recommended' labels and the advice and support it provides to individuals, it has helped to achieve significant CO_2 savings. Over the course of the EST's lifetime, its own estimates suggest that it has saved over 7 million tonnes of CO_2 at a cost of just £6 per tonne.[21] The EST reaches nearly one million households a year.[22]

3.8 The 'Environment and Greener Living' information on the Directgov website and the 'Act on CO_2' campaign are intended to raise awareness of climate change and the actions individuals can take to play their part.[23] The Government will soon be launching a web-based carbon calculator, allowing individuals and households to

calculate their own CO_2 footprint, and will provide them with tailored advice on the steps they can take to reduce their CO_2 impact.

3.9 Offsetting provides a means of compensating for emissions that cannot be avoided cost-effectively. Defra is currently developing a voluntary code of best practice for the carbon-offset sector to provide greater clarity and foster consumer confidence in this growing market.

3.10 Programmes such as Warm Front[24] and the Energy Efficiency Commitment[25] have improved household energy efficiency. By installing insulation and encouraging the use of more efficient appliances, these programmes are delivering financial benefits for those involved (and so helping to tackle fuel poverty) as well as being a cost-effective means of reducing carbon emissions.

3.11 Upgrading standards can be an effective and efficient means of improving performance. Changes to Building Regulations make new homes 70% more energy efficient than those built in 1990.[26] The Government has proposed that all new homes should be zero carbon by 2016. It has also announced that it will work with business to phase out the sale of inefficient incandescent light bulbs for almost all domestic use, where an efficient alternative exists, by 2011.[27]

The Government has proposed that all new homes should be zero carbon by 2016.

The Government will continue to support positive individual action

3.12 Although the energy efficiency of our homes has increased by around 2% a year since 1970, our increasing demand for energy, mainly from a greater number of households and an increasing use of consumer electronics, has outweighed these gains.[28] One thing is clear: we need to do more.

3.13 The Government will continue to bring forward new policies and tools, where its intervention is required, to enable sustainable choice. For example:

- In the 2007 Budget, the Chancellor announced changes designed to make low carbon choices more financially attractive. These included: increasing the vehicle excise duty differential between high and low emission cars; writing to the European Commission to request a lower rate of VAT for energy-saving products and materials; and tax measures to support micro-generation of electricity.
- Improving the energy performance of older houses is a key issue – it is estimated that around 70% of the homes that will be in use in 2050 have

already been built.[29] The Government is looking at how support for homeowners can be improved to increase confidence in, and uptake of, insulation and energy-efficiency measures. The Budget announced the Government's intention that, over the next decade, all householders will be offered help to introduce energy-efficiency measures.

- The Government will continue to work with businesses to support better labelling of products and services, building on mandatory EU labelling and the existing UK voluntary labelling on new cars.
- It will increase its engagement with manufacturers and retailers on power use by electrical and electronic equipment, targeting issues such as standby consumption, set-top boxes and chargers.
- It will extend its campaign to inform and involve individuals about what they can do to reduce CO_2 emissions, using the 'Act on CO_2' brand. Already in use by Defra[30] and the Department for Transport,[31] this campaign aims to raise awareness and show how individuals can take action to make a difference.
- It will examine the options for introducing a new form of obligation on companies supplying gas and electricity to people's homes that incentivises them to sell less energy and to make money out of providing energy services, such as advice on energy saving and installing energy-efficiency measures, and micro-generation.
- For the longer term, it will examine the feasibility of tradable personal carbon allowances, whereby each individual is allocated a free share of CO_2 emission allowances to use on power and heating in the home and on personal transport, within a national emissions cap. If people use less than their share, they can sell the excess allowances and pocket the cash. If they use more, they can buy extra allowances on the market. A two-year programme of research is currently under way.

We need to design and build lower carbon communities that are also resilient to the expected impacts of climate change.

4. Communities and cities

Community action is a crucial part of the UK's response to climate change

4.1 The design of our towns and cities, and the buildings, energy networks, transport systems and homes within them, is based on assumptions about how energy is produced, used and priced that will no longer be valid in 2050.

4.2 We need to plan and provide less carbon-intensive places to live and work that are also resilient to the expected impacts of climate change. There is no ready-made template to draw from. There are profound questions about how existing cities can be retrofitted for sustainability, even while mobility and urbanisation levels increase.

4.3 All new buildings – residential, commercial and public – should be designed, built and operated to ever higher standards. The layouts of our towns and cities must allow us to live closer to work and public services, have better access to public transport, and allow for green spaces that help keep places cool in hot weather.

4.4 Distributed energy will help to power and heat the low carbon communities of the future. The UK lacks a tradition of local investment in energy production akin to the individual and community wind turbine ownership of countries such as Denmark and Germany. But household micro-generation is likely to become more attractive in the future, even providing the possibility of additional income for owners through the 'export' of excess electricity back to the grid. And at the community level, combined heat and power generation is also likely to become more common, including technologies based on biodegradable waste.

4.5 Community attitudes to change will be important too. Community groups, schools and local authorities can be effective bodies for spreading information and encouraging local action on climate change. The attitudes within communities can change simple behaviours that make a difference to the local environment – from recycling to the school run.

The Government's role is to enable communities and cities to become sustainable

4.6 The Government will help communities to adopt new low carbon technologies,

remove the barriers to change and adapt to the impacts of climate change. This means policies that focus on:

- creating a decision-making framework, planning system and investment environment that encourage development of low-carbon infrastructure, including offices, residential buildings and transport networks;
- supporting work to retrofit and adapt cities, which will require a strong commitment to new technology and innovation;
- delivering more sustainable patterns of travel; and
- providing the information, tools and resources that communities require in order to effectively communicate the need to take action and which actions to take.

Cities and communities are already taking action on local climate change

4.7 Local authorities are starting to commit to greenhouse gas reductions and adapt to climate change. Over 200 of them have demonstrated this by signing the Nottingham Declaration on Climate Change.[32] Around 100 local authorities have taken part in the Carbon Trust's Carbon Management Programme which will help to reduce emissions from their own estates and operations. Leading authorities, such as Woking and the seven Sustainable Energy Beacon authorities, are using innovative projects to reduce emissions in their wider communities.

4.8 The Greater London Authority has recently published an ambitious Climate Change Action Plan. Birmingham has also published a draft action plan on climate change that sets the goal of reducing emissions across the city by 20% from 1990 levels by 2010 and of reducing emissions from homes by 30%. Manchester is seeking to establish a city-region climate change agency. The Government is proposing that a duty be placed on the Mayor of London and the London Assembly to address climate change, including both mitigation and adaptation policies.

4.9 Direct support for community action to tackle climate change is provided through schemes such as the Energy Saving Trust's Community Action for Energy, the Every Action Counts programme, and the Climate Change Communications Initiative. Additional programmes are run through the voluntary and community sector, empowering local groups to take action. The Climate Challenge Fund has granted funding of £8.5 million to trusted intermediaries such as the National Trust,

All new buildings – residential, commercial and public – should be designed, built and operated to ever higher environmental standards.

The recent consultative draft Planning Policy Statement on climate change sets out clear principles for incorporating climate change into the planning process.

the Scout Association and local museums and galleries.

4.10 The Government is funding transport initiatives such as the Sustainable Travel Towns Initiative, which demonstrates how towns can sustainably alter their transport demands. It also supports local authority transport plans that aim to integrate transport planning with the planning of land use and other services.

4.11 Recycling of, for example, glass, paper, and plastic bottles reduces total greenhouse gas emissions when compared with disposal in a landfill and new manufacture. Local authorities, working with the Government's direction and support and with the cooperation of households across the country, have helped to dramatically increase the UK's recycling rate since 1997. Although the UK still lags behind much of the EU, recycling rates continue to climb year on year.

More needs to be done at city and community level if the UK is to succeed in meeting its goals on climate change and energy security

4.12 Climate change mitigation and adaptation strategies need to be factored into the UK's planning system. The recent consultative draft Planning Policy Statement (PPS) on climate change sets out clear principles for incorporating climate change into the planning process, both for the preparation of spatial plans and in the consideration of applications for development.

4.13 The White Paper *Planning for a sustainable future* builds on the core principles of the draft PPS with a commitment to legislate on the role of local planning authorities in tackling energy efficiency and climate change. The White Paper also aims to help speed up consideration of larger energy projects, including renewables, by introducing a national policy statement to guide the handling of planning applications for electricity generation projects above 50 megawatts, and for significant gas projects. An infrastructure planning commission will be established to consider the applications. The Government is committed to supporting micro-generation, and is scaling back the burden of (under certain circumstances) planning permission needed for installing micro-generation.

4.14 Climate change is also the first test for the new relationship between the Government and local authorities. The 2006 White Paper *Strong and prosperous communities: The local government White Paper* reflected the belief that local authorities are ready to take responsibility for setting local priorities and delivering against them. Government's role will shift from setting duties to monitoring progress

Case study: Low carbon development of the Thames Gateway

The Thames Gateway is Europe's largest regeneration project, stretching for 40 miles along the Thames Estuary from the London Docklands to Southend in Essex and Sheerness in Kent. It is hoped it will provide a model for the sustainable development of the future. A feasibility study in progress will define how the Gateway could be made a low or zero carbon area through changes to buildings, transport, water production and energy distribution.

The Thames Gateway currently houses 1.6 million residents in 700,000 households. By 2016 the Government intends to create 160,000 new homes and 180,000 new jobs in the Gateway and improve education, health and transport facilities.

through a new performance framework, including indicators on climate change.

4.15 The Government's strategy for engagement is being strengthened. There are many civil society and business coalitions that are concerned with climate change, and which, through their closeness to consumers, are likely to be powerful agents for change. Government needs to support these efforts, for instance by creating a central point of contact and mechanisms to share best practice.

4.16 Going forward the Government will also:

- look at establishing progressively tighter environmental performance standards for commercial buildings, with a view to emulating the progress being made in housing;
- address the retrofitting of existing buildings alongside our proposals to make new homes zero carbon by 2016;
- examine the recommendations of the Royal Commission on Environmental Pollution on making the UK's cities more 'liveable';
- facilitate the reform of passenger transport authorities and executives in major cities to enable public transport to be planned in a more sustainable way, and modernise the framework for bus services outside London, to provide a better deal for passengers;
- continue to improve waste management to minimise climate change impacts and to contribute to the energy generation mix, as set out in the 2007 Waste Strategy for England; and
- work with intermediaries, such as civil society organisations, faith groups and business, to engage people on the need for action and how to make a difference.

Just as mechanisation and specialisation once transformed the role of labour in production, business now needs to develop technologies to transform the way we use natural resources.

5. Business

The efforts, investment and ingenuity of business will deliver the transition to a low carbon economy

5.1 The transition to a low carbon economy requires the investment, innovation and ingenuity of business. Business will need to develop technologies that transform the way we use natural resources, just as mechanisation and specialisation once transformed the role of labour in production. Every stage of the production process – research, design, manufacturing, marketing and sales – will need to be re-engineered. As the energy and carbon intensity of markets and supply chains is reduced, the products, services, business models and competitiveness of many individual firms will be challenged (Box 4).

5.2 The UK is comparatively well prepared. The energy intensity of the UK's GDP has fallen significantly over recent decades and the sensitivity of the economy to energy price changes is less than it has been in the past. The direct impacts on competitiveness of carbon pricing, for example, are concentrated in the small minority of energy-intensive sectors with internationally traded products (Box 5).

Box 4: Climate change – a challenge and an opportunity for business

"Global warming, we judge, is likely to prove one of those tectonic forces that – like globalisation or the ageing of populations – gradually but powerfully changes the economic landscape in which our clients operate… Climate change poses many challenges but also presents many business opportunities. Firms that recognise the challenge early, and respond imaginatively and constructively, will create opportunities for themselves and thereby prosper. Others, slower to realise what is going on or electing to ignore it, will likely do markedly less well."

Source: Lehman Brothers, *The Business of Climate Change*, 2007

Box 5: Carbon pricing and economic competitiveness in the UK

Analysis commissioned by the UK Government suggests that few industries are likely to suffer significant impacts as a consequence of pricing the cost of carbon emissions in the UK. In analysis conducted as part of the 2007 Energy White Paper, sectors such as basic metals, paper, and wood and wood products are identified as being particularly sensitive to achieving a significant reduction in carbon emissions by 2020.

The design of instruments to tackle climate change can alleviate some of the potential adverse economic effects. For example, the Energy White Paper analysis shows that if the UK invests in more cost-effective abatement options abroad through trading schemes such as the EU ETS and Kyoto Clean Development Mechanism, the effects on output are reduced by up to half in the basic metals and paper sectors, and around a third in wood.

The threat of international relocation is also unlikely. The Stern Review found that very few of these sectors have internationally mobile plant and processes. Trade diversion and relocation are less likely the stronger the expectation of eventual global action, because such firms tend to take long-term infrastructure and investment decisions.

Source: Energy White Paper, 2007, and Stern Review, 2006

5.3 A growing number of UK firms are seeing the direct business, brand-building and workforce motivation benefits of improving the sustainability of their business, and are making explicit commitments to do so, especially on reducing carbon emissions and cutting waste. These will have cascade effects through their supply chains and create further challenge to the market.

5.4 A key issue for many businesses is the need to more carefully measure, manage and reduce energy consumption and greenhouse gas emissions. This often reveals real opportunities to improve performance. Cost-effective options for saving energy can range from investment in more efficient plant and energy-efficient processes to measures as simple as ensuring that employees turn off lights and computers when leaving work. For example:

- It has been estimated that UK small and medium-sized businesses waste on average 30% of the energy they buy.

This is equivalent to £1 billion being lost through poor control of heating, air conditioning and ventilation and by appliances being left on but not in use.[33]

- A study of 74 large companies drawn from 18 sectors in 11 countries showed that investments in energy efficiency had given these companies gross savings of $11.6 billion.[34]

5.5 As with the preceding revolutions in agriculture, industry and information technology, the transition to a low carbon economy will bring about fresh opportunities for wealth creation, markets for new products and services and employment in new industries:

- The International Energy Agency has estimated that the world investment from both private and public sectors in energy infrastructure will total $20 trillion to 2030.[35] Even more investment will be needed if this energy infrastructure is to be low carbon infrastructure.
- The global low carbon energy market is already worth $38 billion and employs 1.7 million people. By 2050, it is estimated that over 25 million people will be working in the low carbon technology sector worldwide, and the market for low carbon technology products is likely to be worth at least $500 billion a year.[36]
- London is emerging as a leading centre for carbon trading and related services. This rapidly growing global market was worth an estimated €22.5 billion in 2006, compared with €9.4 billion in 2005. A leading survey suggests that global traded volumes, estimated at 1.6 billion tonnes CO_2 (or equivalent) in 2006, will grow 50% in 2007.[37]

Box 6: Three steps to reducing a business's carbon footprint

1. Think about reducing your direct emissions, for example from heating, lighting, electricity and gas on your site. Why not consider an energy survey or the Enhanced Capital Allowance scheme?
2. Look at your indirect emissions – these are generated from the suppliers you work with and customers you sell to. You could encourage all businesses you work with to become more energy efficient through activities such as raising employee awareness or applying for an energy efficiency loan.
3. If appropriate, develop a robust offsetting strategy (see paragraph 3.9).

Source: Carbon Trust

The Government has constructed a policy framework for energy security and carbon emission reductions that harnesses the strengths of competitive markets

5.6 Climate change has been described by Nicholas Stern as the "world's biggest" example of market failure.[38] Government's role is to correct market failures, and to create the conditions for a low carbon economy within which business can thrive.

5.7 At a national and international level there is a need for a credible, consistent and stable policy environment that creates positive incentives for business and provides the impetus for change. A predictable and supportive policy environment helps to give business greater confidence about the markets of the future, and a framework within which innovation and identification of least-cost solutions to decarbonising the economy can take place.

5.8 The Government's efforts are focused on:

- establishing a **price of carbon** that is widespread, meaningful and provides more certainty for investors and so encourages research, investment and innovation in the development of lower carbon products and services;
- using additional **technology policies** to increase the pace and scale of the low carbon transition;[39] and
- taking specific action to overcome market failures such as **information and behavioural barriers** which inhibit the move to a low carbon economy.

5.9 In 2001 the Government introduced the Climate Change Levy and Climate Change Agreements – a package of measures to incentivise improved energy efficiency in business. In 2002 it launched the world's first national economy-wide carbon emissions trading scheme, in the form of the voluntary UK Emissions Trading Scheme.[40] This experience helped preparation for the EU ETS, which the UK has strongly supported and which now sets a carbon price across 46% of the UK economy.

5.10 The Government recognises the need for increased certainty about future carbon policy and pricing. The five-year carbon budgets proposed in the draft Climate Change Bill will define an emissions pathway to the UK's long-term target and provide greater long-term certainty about carbon constraints in the economy. The Government is playing a leading role in international efforts to secure a transformative agreement on greenhouse gas emissions and remove the uncertainty

A growing number of UK firms are seeing the direct business, brand-building and workforce motivation benefits of improving the sustainability of their business.

about the post-2012 international framework. It is also seeking to clarify the future scope, ambition and mechanics of the EU ETS.

5.11 The Government understands the critical role of business investment in delivering national energy security. The Energy White Paper sets out a series of measures to remove barriers to investment in energy supply and low carbon energy infrastructure. The Government is an active proponent of competitive energy markets in the UK, in Europe and internationally.

5.12 The Government is supporting low carbon research and the 'push' of innovative technologies towards product demonstration stages. For instance, the new Energy Technologies Institute will be a 50:50 public–private partnership with the aspiration of raising £100 million per year for UK-based energy research, design, demonstration and development. The Low Carbon Transport Innovation Strategy sets out the Government's approach to stimulating innovation into lower carbon transport technologies. The development of low carbon technologies will also benefit from the creation of a new Environmental Transformation Fund, details of which will be announced later this year.

5.13 The Government is engaging with business on the risks, implications and opportunities arising from climate change:

It has been estimated that UK small and medium-sized businesses waste on average 30% of the energy they buy.

- It supports the Carbon Trust to provide technical assistance to UK businesses and their carbon management programmes.
- It funds the Market Transformation Programme which works with businesses to reduce the environmental impact of products across the product life cycle.
- It is encouraging business leadership on climate change action, as illustrated by initiatives such as the consumer-facing 'We're in this together'[41] campaign and the Carbon Disclosure Project,[42] an institutional investor collaboration on the business implications of climate change.
- The Commission on Environmental Markets and Economic Performance has been established to advise on how the UK can make the most of the opportunities which transition to a low carbon economy can present for wealth creation and employment growth.
- The Climate Change Projects Office, jointly funded by the DTI and Defra, is promoting UK investment in international emissions reduction projects and the carbon credits arising from them. These activities help UK business to

make the most of the opportunities provided by the Kyoto Clean Development Mechanism and Joint Implementation credits.

Future policy efforts will focus on establishing a price of carbon that is widespread, meaningful and provides more certainty for investors, coupled with policies that tackle the barriers to technology development and deployment, and market failures

5.14 To bring about emissions reductions at lower cost and more effectively, the global carbon market should be made deeper, more liquid and wider in coverage.[43] A priority for the Government is **the forthcoming EU ETS review** and the opportunity it provides to influence how the design and function of the scheme is improved for future phases, and to provide greater long-term visibility on the ambition for the scheme to provide greater certainty for investors. It is important that the scheme meets the needs of consumers, business, and the environment, and also provides a flow of investment in carbon abatement to developing countries.

The global low carbon technology market is already worth $38 billion annually and employs 1.7 million people. By 2050, it is estimated that it could be worth $500 billion annually and employ over 25 million people.

By removing small emitters from the scheme from 2008, the UK will also be reducing the overall administrative burden of the system, in line with the principles of better regulation.

5.15 The Government is introducing a scheme, the Carbon Reduction Commitment, that extends emissions trading to large non-energy intensive private and public sector organisations. The Carbon Reduction Commitment will raise the profile of energy and carbon management in these sectors, thereby helping to tackle barriers that prevent take-up of cost-effective opportunities for energy and carbon savings. This should also increase demand for emerging energy-efficient products.

5.16 Specific technology policies can further increase the pace and scale of low carbon innovation. The UK should work with other countries to mobilise funds for the demonstration of key technologies, to help viable ideas cross the void between research and development and deployment. While there is a need for basic research and funding to 'push' ideas and innovations towards product demonstration, there is also a need for measures that help 'pull' these products towards viability in the competitive marketplace.

5.17 The Energy White Paper has called for **raised product standards**, for instance in major energy using products such as motors, lights, household appliances and

consumer electronics. While we need to be mindful of the need to minimise bureaucracy and administrative burdens,[44] demanding new standards, set sufficiently far in the future to provide the space and time for product innovation, can provide the certainty needed to encourage business investment. This can encourage action all along the supply chain, not just for the end product. For the UK, the setting of mandatory common standards is likely to take place first at EU level. But going further, coalitions with governments beyond Europe, such as Japan and China, could further enlarge the markets for new low carbon products.

5.18 There are also opportunities to exploit the power of **public sector procurement spending**, estimated to be worth up to £150 billion annually. The Government is experimenting with the use of 'forward commitment' techniques, which set challenging outcome-based product specifications in return for a guaranteed market. LED lighting systems are an early example of the type of low energy products where such an approach may yield benefits.[45]

5.19 Finally, the Government will continue to engage with business, raise awareness of the potential for energy efficiency and encourage the development of new markets that support the transition. It will encourage standardised approaches to carbon reporting so that the public can have confidence in businesses' claims of action. It will continue to explore how new markets can be created to serve business and consumer needs – such as in energy services – to drive investment in improved energy efficiency.

The credibility of the UK's international position is founded on the strength of its own action and domestic performance.

6. National efforts

The credibility of the UK's international position is founded on the strength of its own action and domestic performance

6.1 The UK cannot meet its climate change and energy security goals alone. The UK has the world's fifth largest economy, but its share of global CO_2 emissions is only 2%. Its energy security is increasingly linked to the efficiency of EU energy markets and the reliability of supplies from the Middle East, Russia, Central Asia and Africa.

6.2 The UK therefore needs to work with other countries and international organisations – whether to agree stretching global targets to reduce greenhouse gas emissions, or to liberalise energy markets. It needs to demonstrate leadership and persuasiveness.

6.3 The credibility of the UK's international position is founded on the strength of its own action and domestic performance. It should continue to make progress in tackling greenhouse gas emissions at the same time as maintaining a productive, competitive economy.

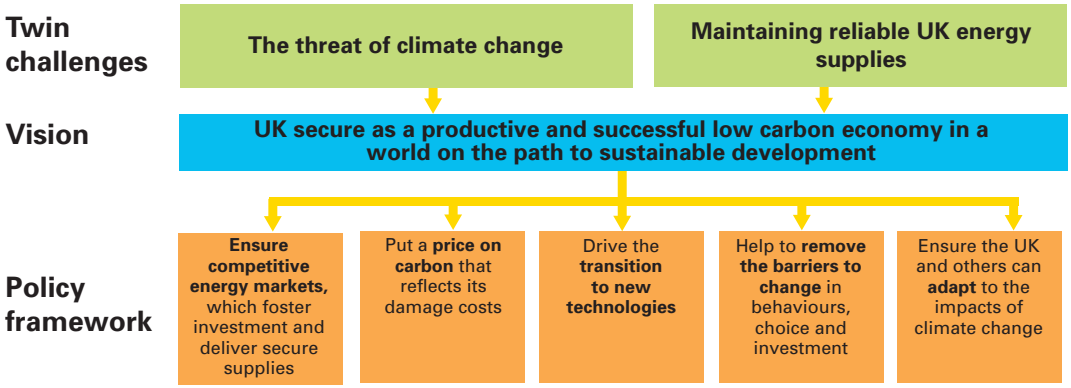
The UK's domestic policies have evolved rapidly and are now among the most robust in the world

6.4 Chapters 3 to 5 have set out the roles of individuals, communities and business, and the supporting policies that the Government has put in place. These efforts contribute to the overall UK national policy framework (Figure 5) that aims to address the twin challenges of energy security and climate change.

The UK has the world's fifth largest economy, but its share of global CO_2 emissions is only 2%.

6.5 The Government's leadership on tackling climate change is signalled by the UK's unilateral CO_2 emission reduction target of 60% by 2050 on 1990 levels, with real progress of a 26–32% reduction by 2020. In its outlook and the scale of reduction, this target goes well beyond anything required by any existing international agreement.

Figure 5: The UK's twin challenges, vision and policy framework



6.6 The recently published draft of the **Climate Change Bill** takes the development of the UK's national policy framework to a new level. If it is enacted, the UK will be the first country in the world to create both a long-term CO_2 emissions target and a system to deliver it into national law. It will set a **clear CO_2 emissions reduction path** to 2020 and beyond, through a series of five-year carbon budgets announced well in advance. An independent Committee on Climate Change will advise government on these budgets.

6.7 The Bill also contains important **enabling powers** by which the Government could introduce new measures to reduce CO_2 emissions if necessary. These could, for instance, be used to bring in new cap-and-trade systems in sectors outside the scope of the EU ETS. The Government intends to keep under review options for additional measures.

6.8 The latest illustration of the Government's integration of policies for energy security and climate change is the 2007 Energy White Paper. This sets out among other things: a strategy to tackle climate change and energy security together; measures to become more energy efficient domestically, plans to support more distributed forms of energy; additional support for renewable energy (adjusting and extending the Renewables Obligation[46]); and proposals to make the planning system more efficient, for instance for companies that are proposing to build nuclear power stations.

6.9 The **Government is also committed to taking action itself**. It has recently set ambitious new targets for the Government estate, including a 'carbon-neutral' office estate by 2012, and set out its plans for

achieving both sustainable procurement[47] and improving its procurement capability.[48]

6.10 The wider public sector also has an important role to play (being a source of greenhouse gas emissions itself), in showing leadership, as a consumer of goods and services and as a responsible employer. Local government and the NHS will be publishing their own plans for achieving sustainable procurement this summer. The NHS has set itself challenging energy and emission reduction targets for its ongoing operations and new-build. And the Government is building more sustainable schools (as part of its Building Schools for the Future programme for renewal and refurbishment of the nation's secondary schools) and other social housing delivered by the Housing Corporation and English Partnerships.[49]

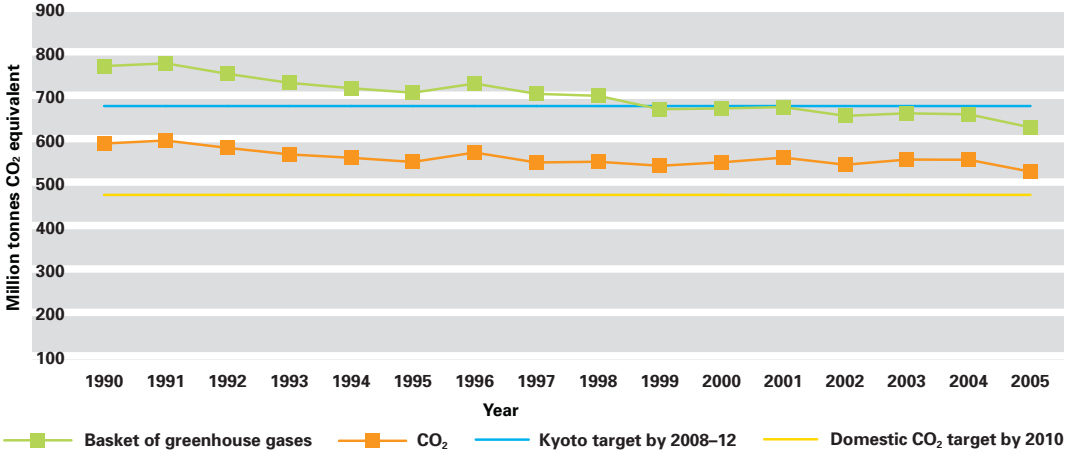
The recently published draft of the Climate Change Bill takes the development of the UK's national climate policy framework to a new level.

The challenge now is to strengthen policies further and focus on delivery

6.11 As the UK seeks to make further progress towards its 2050 targets, the path ahead promises to be more challenging than that already travelled. The UK is on track to exceed its Kyoto Protocol targets, but meeting the Government's 2010 domestic CO_2 target of a 20% cut on 1990 levels will be difficult (see Figure 6).

6.12 Working towards a global carbon price is a key objective. **The EU ETS is**

Figure 6: UK progress against Kyoto and 2010 domestic CO_2 targets



Source: AEA Energy and Environment, and Defra (taking into account the effect of the EU ETS)

The wider public sector also has an important role to play, in showing leadership, as a consumer of goods and services and as a responsible employer.

the Government's policy instrument of choice for carbon pricing. The UK is committed to strengthening the EU ETS, creating greater long-term visibility about the ambition for the scheme, and establishing a **price of carbon** that is meaningful through progressively tighter caps, thereby creating supportive conditions for investment in low carbon technologies.

6.13 Carbon trading provides flexibility and cost-effective abatement. But the facility to purchase credits from elsewhere in Europe (via the EU ETS) and beyond (within limits, through the Clean Development Mechanism) means that in tracking success we need to move from a sole focus on abatement within the UK towards recognising the total abatement efforts made by the UK, wherever they happen.

6.14 The Government is committed to using a **mix of instruments** to achieve its policy objectives on energy security and climate change. Fiscal measures, incentives, regulation, voluntary approaches and active engagement all have a role to play. The Stern Review reinforced the message that climate change is a central economic as well as an environmental challenge, and the UK is commited to engaging with finance and economic ministries around the world to focus on the macroeconomic impacts and the design of cost-effective policy instruments to mitigate climate change.

6.15 The Government recognises that the UK should also be prepared to lead in the **demonstration of new technologies**. In the 2007 Budget, the Government announced a competition to develop a full-scale demonstration of carbon capture and storage. A successful demonstration programme would help the UK realise its energy security and climate change goals by showing that fossil fuels can have a role in a low carbon energy strategy. It would also demonstrate to the international community that the UK is willing to invest in new solutions to a collective problem.

6.16 Government and the wider public sector are in a position to **lead by example**, recognising the opportunities to use the public sector's large workforce and its substantial procurement spend to effect change. All government departments need to intensify their efforts to deliver on their own central operations targets. Beyond Whitehall, the wider public sector needs to set a clearer level of ambition on carbon emissions, focus on outcomes and put in place the systems and support needed to deliver its objectives.

6.17 Approximately 5.8 million people are employed in the public sector, around 20% of the UK workforce. These people could be agents of change in the efforts to improve the public sector's performance on sustainability, including carbon emissions. Improvement in, for example, energy efficiency or waste management arising through behavioural change can save money and will release resources for frontline services. Working with stakeholders, the Government will develop and support employee engagement campaigns in the public sector. It will create mechanisms for a working-level exchange of ideas and good practice on employee engagement among departments and public sector organisations.

6.18 Some change in the climate is now inevitable, and the UK needs to **adapt**. The Climate Change Bill acknowledges this and proposes a new duty on the Secretary of State for the Environment to assess the risks of current and predicted impacts for the UK and to set out the proposals and policies for the Government to adapt to climate change on a five-yearly basis.

6.19 The assessment of the impact of climate change for the UK is greatly facilitated by the UK Climate Impacts Programme. This has been supported by the Government since 1997 and has developed the scientific basis needed for decision-making on adaptation. The Government will set out its proposals and policies for taking action in a **framework for adaptation**, to be published by the end of 2007. The framework will also define roles and responsibilities – what can be expected from government, and what government expects from other stakeholders. Adaptation concerns are also increasingly integrated within other areas of policy – for instance a major output of the forthcoming Water Strategy, due in the summer of 2007, will address how we can adapt to changes in the demand and supply for water resources caused by climate change.

The EU is the only international grouping with both an appreciation of the urgency and the capability to be a global leader on climate change.

7. EU action

The EU is large enough to change the terms of the climate change debate

7.1 The EU is home to 5% of the world's population but is responsible for more than 15% of the world's greenhouse gas emissions. It is the world's largest single market and generates more than 30% of global GDP. European companies and EU trade links shape markets, investment and innovation across the globe.

7.2 The EU therefore has the power to influence climate change and energy security outcomes in a way that most individual countries cannot. To meet these twin challenges and realise the opportunities on offer, it needs to lead global action on climate change as well as cutting its own emissions.

7.3 Working as a single negotiating block, the EU can champion the development of a post-2012 framework that delivers substantial global emissions cuts while maintaining global equity. But that same principle of equity means that it needs to radically cut its own emissions.

7.4 The challenges the EU faces in doing so echo the concerns of the wider international community: reconciling economic growth with large cuts in carbon emissions; switching from fossil fuel subsidies to carbon pricing; and encouraging investment in new sources of clean power while encouraging competitive energy markets. By successfully taking on these challenges, the EU can demonstrate to others that change is possible without sacrificing economic growth or the security of energy supplies. EU leadership in setting strict product standards and creating markets for carbon trading also has direct and indirect impacts around the world. In short, the EU is large enough to be able to change the terms of the debate.

7.5 This is a task that the EU was designed for – addressing global problems that

Working as a single negotiating block, the EU can champion the development of a post-2012 framework that delivers substantial global emissions cuts while maintaining global equity.

require cooperation across borders. Europe has a strong environmental record on which to build – from air pollution and water quality to recycling. But in future, Europe should go further. Key steps to this end are to:

- develop a low carbon economy in Europe by extending and strengthening the EU ETS;
- modernise the EU's budget – through further reform of the Common Agricultural Policy and an increased focus on today's problems of climate change and energy security; and
- use its power as the biggest political and economic union in the world to build a coalition of developing and developed nations committed to tackling climate change.

The UK Government's role is to influence the EU's energy security and climate change agenda to deliver effective and efficient solutions

7.6 The UK will continue to play a leading role in shaping and influencing EU climate change and energy security agendas through its diplomatic work within the EU and through its positive and proactive relationships with the European Commission and individual Member States. It will demonstrate leadership on specific energy and climate change issues by setting an example, with domestic policies that encourage a transition to a low carbon UK economy without compromising competitiveness.

7.7 Successfully influencing the EU climate change and energy security agenda will yield significant benefits for the UK:

- The EU is the only international grouping with both an appreciation of the urgency and the capability to be a global leader on climate change. It therefore has a key role to play in international climate change negotiations.
- Carbon pricing, technology and product standards and energy market competition policies for the UK are often most sensibly set at European levels, helping to safeguard UK competitiveness.

The EU is already making progress in tackling climate change and energy security

7.8 The EU has adopted a mix of targets, market-based instruments, regulatory measures and engagement:

- Under the Kyoto Protocol, the EU as a whole agreed to cut its emissions by 8% below 1990 levels for 2008–12.
- It has adopted a common objective to limit global average temperature increase to no more than 2°C above pre-industrial levels.

Box 7: Carbon trading in the EU Emissions Trading Scheme

The EU ETS is a mandatory scheme that covers nearly half of Europe's CO_2 emissions. The scheme began in 2005 and puts limits in place on total CO_2 emissions from electricity generation and certain heavy industries in line with the EU's and Member States' international obligations. As the cap on emissions tightens in successive phases, the carbon price this scheme generates will act as an incentive for companies to reduce their own emissions (either through using cleaner fuels or by investing in new technologies and energy efficiency) while providing the flexibility for them to buy emissions reductions from elsewhere if that is cheaper.

- In 2005 the EU launched the first phase of the EU ETS, the world's largest carbon emissions trading scheme, covering almost 50% of the EU's CO_2 emissions (Box 7).
- At the 2007 Spring Council, Heads of State agreed a greenhouse gas reduction target of 20% by 2020, rising to 30% if a post-2012 global agreement can be reached. They also agreed a demanding target of 20% for the proportion of the EU's energy use to be supplied from renewable sources by 2020; an improvement in energy efficiency to reduce the EU's energy consumption by 20% compared to projections for 2020; and measures to promote competitive energy markets, including effective separation of supply and production activities from network operations.
- The EU has adopted a series of challenging Directives governing energy and resources, from the energy performance of buildings to disposal of biodegradable waste at landfill.
- It has agreed to develop the necessary technical, economic and regulatory frameworks to bring environmentally safe carbon capture and storage to deployment with new fossil fuel power plants, if possible by 2020, and to aim to construct and bring into operation up to 12 demonstration plants by 2015.
- It has established collaborative projects with key developing countries, such as the EU-China partnership on climate change (see Box 8) and the EU-India initiative on clean development.
- It is also working on strategies for adaptation – both within its own borders and in its interactions with third countries.

Box 8: The Near-Zero Emissions Coal Project

The Near-Zero Emissions Coal Project was announced in September 2005 at the EU-China Summit. It is expected to result in the construction of the first carbon capture and storage demonstration project outside the OECD by 2020 at the latest. The project has three phases:

- Phase 1 (2006–08) – to identify early demonstration opportunities.
- Phase 2 (2009–10) – to define, plan and design the project.
- Phase 3 (2011–15) – to construct and operate the project.

Phase 1 is under way with €1.6 million of EU funding and a UK contribution of £3.5 million.

A priority is for the UK to support open, competitive and well-regulated energy markets across the EU.

7.9 These actions have been supported by the Government, which played a leading role in many of the negotiations. The UK has supported the EU ETS by setting some of the most challenging emission reductions for both phases of the programme.

The UK will continue to support and drive EU action and leadership on climate change and energy security

7.10 UK efforts should lead to collective action based around principles of competitive energy markets, efficient pricing and risk-based regulation.

7.11 The global carbon market should be made deeper, more liquid and wider in coverage. A particular priority is for the UK to work to **strengthen the EU ETS**.[50] Key steps include:

- resolving post-2012 uncertainty by agreeing the future level of ambition and the trajectory for the cap on emissions covered by the EU ETS;
- examining the options for further extending the scope of the EU ETS into new sectors to deliver consistent economy-wide carbon pricing (for example surface transport);
- providing a 'level playing field' for businesses in Europe and making the market more transparent and efficient;
- recognising the potential to accelerate development of a global carbon market

by linking the EU ETS to other schemes, subject to strong environmental integrity and consistent market rules; and

- guaranteeing that credits from Clean Development Mechanism projects registered by 2012 will be valid for compliance in the third phase of the EU ETS, and therefore bringing forward investment in emission reductions.

7.12 Another priority is for the UK to support **open, competitive and well-regulated energy markets** across the EU. The poorly connected national networks and rigid market structures that currently deliver energy in Europe present a risk to the future security and stability of supplies. A unified, open and competitive energy market will give the whole of Europe greater protection against energy shortages as well as giving out the right signals to drive investment in energy infrastructure, transmission and storage. The EU's position on international energy security can also help to influence the openness and operation of global energy markets.

7.13 The UK will push for the **adoption of more challenging product standards** across the EU. Intelligent regulation can support improved energy efficiency and successful innovation. There is scope for the EU to develop more demanding long-term standards for vehicles, buildings and other energy-using products. It could push for larger international coalitions around these standards, increasing the prospective market and reducing firms' investment risk. Any new EU regulations should be consistent with the principles of better regulation.[51]

The global carbon market should be made deeper, more liquid and wider in coverage. A particular priority is for the UK to work to strengthen the EU ETS.

7.14 The UK will work with others to achieve a **modern EU budget** that is equipped to help meet the challenges of the 21st century, including climate change. The fundamental review of the EU budget, due in 2008–09, provides the opportunity for the EU to revise its spending priorities.

Climate change cannot be solved by the UK alone. Agreement on a post-2012 framework for global action will be vital.

8. The global response

Only collective action at a global level will provide a lasting solution to the challenges of climate change and energy security

8.1 The world community must collectively agree and deliver a plan to reduce greenhouse gas emissions, increase energy efficiency and develop the new technologies that will ensure the transition to a new low carbon world.

8.2 The scientific advice is that, for the average world temperature change to be limited to no more than 2°C above pre-industrial levels, global emissions need to peak and start falling within 10–15 years. The longer the delay, the sharper the adjustment subsequently required. But there are no global targets for emission reductions yet in place beyond 2012, when those made in 1997 under the first Kyoto Protocol commitment period expire.

8.3 To be viable, any post-2012 agreement on greenhouse gas emissions must be seen to be just and equitable. The distributional issues are profound, both across countries and between generations. The greatest impacts from climate change are expected to fall upon some of the poorest nations on the planet – those who are least equipped to respond and have made the smallest contribution to the problem.

8.4 Lags in the climate system mean that action taken today to tackle carbon emissions will take decades to take effect. Action is needed now to protect the wellbeing of future generations in a time beyond the lifespan of today's voters, taxpayers and decision-makers. Current generations will, however, enjoy the co-benefits of a move to a low carbon economy, such as cuts in the health side effects of air pollution that continue to cause premature mortality in the UK,[52] and which have a huge impact on wellbeing and economic productivity in many developing countries.

8.5 Developed countries have made the greatest contributions to the carbon

Any post-2012 global agreement on greenhouse gas emissions must be seen to be just and equitable.

related to human activity in the Earth's atmosphere. But emissions in the emerging economies are rapidly increasing and, looking forward, the developing world will produce the largest share of overall emissions from 2012 onwards. Over 70% of the increase in energy demand in the next 25 years will come from the developing world.

8.6 So a post-2012 global agreement must reverse current trends in greenhouse gas emissions through actions based on principles of common but differentiated responsibilities and the right to sustainable economic development. The agreement will need to have mechanisms that build the trust required to sustain such shared action. It will also need to provide channels for transferring the finance and technology required to realise the goal of a global low carbon economy, and provide support for adaptation to the impacts of unavoidable climate change.

8.7 This is an ambitious, almost daunting, undertaking but, as the latest Intergovernmental Panel on Climate Change (IPCC) assessments show,[53] doing nothing is not a viable alternative. And the Stern Review has shown that, with sensible policies, acting to remove the threat of climate change is an affordable and cost-effective insurance strategy.

Over 70% of the increase in energy demand in the next 25 years will come from the developing world.

The role of the UK in securing the global response

8.8 The UK is committed to finding a lasting international solution to the challenges of climate change and energy security. The Government believes that there is a need for urgent multilateral action. It will continue to use evidence and influence to argue for a just and sustainable settlement on greenhouse gas emissions.

8.9 The Government's strategy is founded on domestic policy leadership and international engagement. The UK:

- aims to make best use of its bilateral relationships and its membership of the EU, G8, the Commonwealth and UN in pursuit of better international understanding of the challenge and a new commitment to action;
- supports competitive global energy markets with no barriers to investment;
- has unilaterally committed to cutting CO_2 emissions by 60% by 2050 (on 1990 levels), with real progress by 2020. This is backed up by recent proposals for a new system of carbon budgeting intended to steer the UK towards a low carbon economy;

- is an active supporter of the use of carbon markets in Europe and of linking to other emerging trading schemes to create a global carbon market; this will mobilise resources for investment and encourage abatement where it is most cost-effective;
- recognises too the role of regulation and common standards in providing certainty and helping to create new global markets for low carbon products; and
- continues to support independent scientific research, economic analysis and technological research and development.

The UK has already played an important role in turning the attention of the world to climate change

8.10 The UK is widely recognised as a leader in the international debate on how to respond to climate change. It has:

- pushed climate change up the global political agenda, using its presidencies of the G8 and the EU in 2005, and informal processes such as the Gleneagles Dialogue, to advocate urgent international action and dialogue;
- helped to advance the collective understanding of the science of climate change, through the work of institutions such as the Met Office Hadley Centre. It has also advanced the understanding of the economics of climate change through the Stern Review, a ground-breaking independent study on the economics of climate change published in 2006.[54] It has instigated bilateral projects with India, China and other countries to study aspects of climate change mitigation and adaptation; and
- helped to develop the international policy framework, as illustrated by its role in implementing the Kyoto Protocol and its support for the development and strengthening of the EU ETS.

The shape of a new agreement and the role of the UK

8.11 The Government considers there to be five essential elements to the global agreement that is so urgently needed:

- A **shared vision of the long-term goal** to provide a yardstick for international efforts and give certainty to business of the future direction of travel.
- **Carbon pricing and emissions trading:** the establishment of a common 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 resource transfer to developing countries through mechanisms such as the Clean Development Mechanism.

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

8.12 While the greater effort needs to be made by developed countries, developing countries also need to play an active part in an enhanced global carbon market. Any future agreement must make sure that developing countries can:

- continue to grow their economies (particularly the poorest countries). This will mean that as their share of global energy consumption grows so too, initially, will their share of global emissions; and
- access information and resources to assist them in reducing carbon emissions and help them adapt to the effects of climate change.

Any post-2012 global agreement must make sure that developing countries can continue to grow their economies, particularly the poorest.

8.13 Measures that could support their engagement might include:

- a strengthened and enhanced Clean Development Mechanism (which could see a greater share of the increased developed country abatement effort being delivered through private investment flows to developing countries), including development of more programmatic approaches to the Mechanism;
- advanced developing countries reducing the emissions intensity of their development, for instance through the initial adoption of non-binding or 'no lose' targets,[55] combined with innovative and enhanced market mechanisms such as sector-based crediting or emissions trading; and
- cross-regional agreements on product and technology standards that expand the market for low carbon goods and technologies across the world.

8.14 There are also opportunities for oil and gas-producing countries to demonstrate their role in the delivery of cleaner fossil fuel-based energy supplies and demonstration of new technologies, such as carbon capture and storage.

8.15 The UK will continue to play its part through:

- **domestic actions to show leadership:** demonstrating commitment through policies that go beyond the Kyoto commitment, and working with other developed economies to show that the transition to a low carbon economy is possible without compromising economic growth or social welfare;
- **high level political engagement:** working to make climate change and energy security a matter for Heads of State and the key departments of national administrations;
- **increasing knowledge** about the effects of climate change in different countries, and building on the Stern Review to examine the specific costs and benefits of taking action compared to business as usual;
- **investing in low carbon technologies and demonstration projects**, such as supporting the World Bank and Regional Development Banks' Clean Energy Investment Frameworks and providing financial support for joint research, development and demonstration of new technologies such as carbon capture and storage. This will be vital in helping enable China and India to make an appropriate contribution to a global and comprehensive post-2012 agreement; and
- **helping developing countries** to build their resilience to climate change through suitable adaptation strategies and projects. The UK can use its leadership in bilateral development assistance and its participation in multilateral development agencies to achieve this.

8.16 The Government and UK non-governmental organisations will also work with non-state parties (businesses, civil society groups and individuals) abroad to communicate the climate change message clearly and effectively.

9. Next steps

9.1 Since they were announced last October, the Policy Reviews have touched on virtually all major areas of policy and involved the entire government. After ten years in power, they have provided a real opportunity to reflect on what has worked (and what has not), what should be intensified, and what new directions should be pursued.

9.2 This paper is the output of the energy and environment strand of the Policy Reviews. As in the case of the other strands, work has been taken forward through Cabinet-level sessions and policy papers specifically drafted for the Policy Reviews. This paper also draws from, and builds upon, several recent statements of Government policy, including the 2007 Climate Change Strategic Framework and the 2007 Energy White Paper.

9.3 The Government's vision is to see the UK secure as a productive and successful low carbon economy in a world on the path to sustainable development. This review looks at the practical steps the UK needs to take over the next five to ten years if this vision is to be realised.

9.4 The global community must collectively agree and deliver a plan to reduce greenhouse gas emissions, increase energy efficiency and develop the new technologies that will ensure the transition to a new low carbon world. And if this agreement is to be in place by 2012 onwards (the end of the first Kyoto Protocol commitment period), it needs to be reached by 2009 in order to provide sufficient time for countries to ratify the agreement. The UK will engage with leaders of the 'G8 plus 5' group throughout 2007, via a series of events leading up to the next formal UN climate change meeting in Bali in December 2007, and onwards through 2008 and 2009.

9.5 Within the EU, the priority is to ensure that the ETS helps to provide a price for carbon that reflects the damage it causes to the environment and society, and encourages low carbon investment. There is a need for greater certainty for investors. The Government, major businesses and NGOs have published a joint manifesto that outlines the key principles and priority actions that the EU ETS should follow. The Government will play its role in the ongoing

review of the EU ETS and help to inform the European Commission's autumn 2007 proposals for its further reform.

9.6 Another EU-level priority is to take forward the package of decisions made at the 2007 Spring Council, particularly the 20% share of energy that must come from renewable sources by 2020. The next steps are to agree how to share the burden among Member States, starting with detailed proposals from the European Commission in the autumn of 2007.

9.7 At home, the draft Climate Change Bill marks the beginning of a fundamentally new approach for the UK to tackle climate change, as well as demonstrating leadership to the international community. Public consultation on the draft Bill closes in June 2007, after which it will go to Parliament for enactment. If, as hoped, the Bill passes into law, a radical new system of five-year carbon budgets will be put into place.

9.8 The recently published Planning and Energy White Papers, the May 2007 Waste Strategy and the summer 2007 Water Strategy are all part of an increasingly integrated UK approach to energy security, climate change and wider environmental concerns. The White Papers call for several important public consultations to be launched by the end of 2007 – on planning reforms (especially major energy infrastructure projects), nuclear power, the Renewables Obligation and the detailed design of the Carbon Reduction Commitment.

9.9 More will be done to empower communities and cities to take action. A key decision for 2007 will be how to take account of climate change concerns within the future local government performance framework. This will be announced as part of the Comprehensive Spending Review in the autumn.

9.10 Government, businesses and individuals know that when it comes to climate change, 'We're in this together'. UK businesses must continue to develop new low carbon technologies and reduce the emissions from their own operations. And individuals and households must be provided with ever-better information, products, incentives and support with which to make sustainable choices about their lives.

9.11 Other long-term work being undertaken across government includes the Comprehensive Spending Review and the Capability Reviews of government departments. These reviews, taken together with these Policy Reviews, will outline the broad approach the Government takes to energy and environment policy over the coming decade.

Endnotes

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20 The EST is a non-profit organisation set up by government in 1993 and funded by government and the private sector. It has a mandate to cut CO_2 emissions in the household and transport sectors. www.est.org.uk

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24 The Warm Front Grant provides insulation and heating improvements for those households most vulnerable to cold-related ill health.

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28 Energy Saving Trust, *Rise of the Machines*, 2006.

29 Sustainable Development Commission, *Stock Take: Delivering improvements in existing housing*, 2006.

30 www.direct.gov.uk/actonco2

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33 Carbon Trust, press release, 28 October 2004.

34 Climate Change Group, *Carbon Down, Profits Up*, 2005.

35 IEA, *International Energy Outlook*, 2006.

36 The Stern Review, 2006.

37 Point Carbon, *Carbon 2007 – A New Climate for Carbon Trading*, 2007.

38 The Stern Review, 2006.

39 A heavy reliance on the 'push' of new low carbon technologies, rather than creating the conditions for a 'pull-through' from the market, is unlikely to be successful. Introducing a carbon price helps make low carbon technologies more competitive, but uncertainty today about future carbon prices (in an industry where capital assets may have a life of 30 years or more) means the price is discounted in decision making.

40 The UK ETS closed at the end of 2006 and has been superseded by the EU ETS.

41 See www.theclimategroup.org

42 See www.cdproject.net

43 The EU ETS currently covers 46% of the UK economy. In spring 2007, the price for a tonne of carbon in Phase I was < €1, with relatively high volatility throughout its trading history, while Phase II forward prices are in the range €15–€20.

44 The Government is considering how it can do this in the light of the Better Regulation Commission's report on climate change regulation.

45 The UK Government's Sustainable Procurement Action Plan commits the Government to looking at replicating forward procurement more widely in the public sector.

46 The Renewables Obligation works by placing an obligation on electricity suppliers to purchase a given percentage (7.8% for 2007–08 rising to 15.4% by 2015–16) of their electricity from certified renewable sources. Suppliers can meet their obligation either by presenting Renewable Obligation Certificates (ROCs) or by paying a buy-out price set at £34.30/megawatt hour in 2007–08 and indexed to inflation, or by a combination of the two. Money paid into the buy-out fund is recycled to ROC holders at the end of the 12-month Obligation period.

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50 Some of the principles and priority actions for this are set out in a joint Government/business/NGO publication, *UK Manifesto for the EU Emissions Trading Scheme (EU ETS)*, 2007.

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55 No-lose targets attract no penalty for failure, but rewards for success.