

Energy and climate security: a global challenge

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

1.2 This chapter sets out:

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

BOX 1.1 RISING GLOBAL ENERGY DEMAND WILL INCREASE CARBON EMISSIONS

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

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

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

* IEA, World Energy Outlook, 2006



The impacts of climate change and the case for action

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

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

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

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

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

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

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

1.9 The costs of mitigating climate change, though significant, are substantially lower and are manageable for the world's economy.

The annual cost of stabilising greenhouse gases in the atmosphere at between 450 and 550 ppm of carbon dioxide equivalent is estimated to be around 1% of GDP in 2050¹⁵.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



BOX 1.2 CONTINUED

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

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

Securing energy supply

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

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

BOX 1.3 PRIMARY ENERGY RESERVES

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

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

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

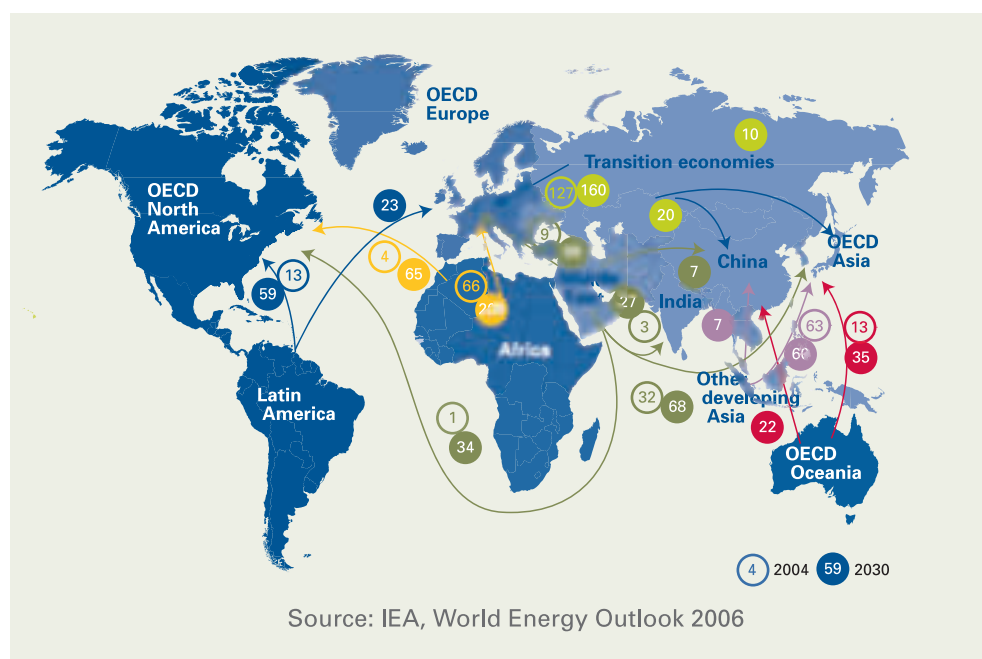
* Organisation of Petroleum Exporting Countries

** IEA, *World Energy Outlook*

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

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

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



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

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

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



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

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

How will these trends and risks affect the UK?

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

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

In particular:

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

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

Our international energy and climate strategy

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

BOX 1.4 EU ENERGY POLICY

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

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

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

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



1.22 Our international strategy is built around four main elements:

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

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

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

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

Open, competitive energy markets

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

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

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

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

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



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

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

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

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

²⁰ Details available at www.energy-community.org

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

²² Details available at www.encharter.org

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

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

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

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

Putting a value on carbon

1.30 Our priorities are to:

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

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

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

²⁴ Details available at www.eitransparency.org

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



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

1.33 We want the EU to:

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

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

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

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

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

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

Driving investment to accelerate the deployment of low carbon technologies

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

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

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

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



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

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

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

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

BOX 1.5 CARBON CAPTURE AND STORAGE (CCS)

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

* IEA, *World Energy Outlook 2006*

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

The current European figures come from Eurostat. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL

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

BOX 1.5 continued

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

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

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

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

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

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

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

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

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



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

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

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

Promoting energy efficiency

1.46 Our priorities are to:

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

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

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

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

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

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

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

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



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

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

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

BOX 1.6 ACCESS TO ENERGY FOR DEVELOPING COUNTRIES

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

Taking this agenda forward

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

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

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

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

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



Summary of our international energy and climate Strategy:

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

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