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ENERGY WHITE PAPER -
A Summary

Our energy future -
creating a low
carbon economy

dti

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Cleaner, Smarter Energy: policies for a low carbon future

- 1.1 Our country needs a new energy policy. Despite the improvements made over the last five years, today's policy will not meet tomorrow's challenges. We need to address the threat of climate change. We must deal with the implications of reduced UK oil, gas and coal production, which will make us a net energy importer instead of an energy exporter. We need over the next 20 years or so to replace or update much of our energy infrastructure.
- 1.2 With these challenges come new opportunities. To shift the UK decisively towards becoming a low carbon economy. To develop, apply and export leading-edge technologies, creating new businesses and jobs. To lead the way in Europe and internationally in developing environmentally sustainable, reliable and competitive energy markets that will support economic growth in every part of the world.
- 1.3 Energy is fundamental to almost everything we do. We expect it to be available whenever we want, affordable, safe and environmentally sustainable. Only when something goes wrong do we realise how much modern industrialised countries depend upon extremely complicated energy systems.
- 1.4 Against this background, we published on 24 February a white paper, *Our energy future - creating a low carbon economy*. This summarises the main conclusions.




The challenges we face...

- 1.5 The first challenge is **environmental**. Climate change is real. The 1990s were the warmest decade since records began. Without action to reduce greenhouse gas emissions, the earth's temperature is likely to rise faster than at any time in the last 10,000 years or more. In the UK, risks of droughts and flooding are likely to increase. Sea levels will rise, so extreme high water levels could be 10 to 20 times more frequent at some parts of the east coast by the end of the century. But the worst effects of climate change can be avoided if greenhouse gases in the atmosphere are stabilised instead of being allowed to increase. Far more needs to be done. The UK will continue to show leadership but cannot solve this problem alone. UK emissions of carbon dioxide are only about 2% of the global total. A concerted international effort is needed. We will continue to work with other countries to establish a consensus around the need for change and for firm commitments to take action to reduce carbon emissions world wide within the framework of the UNFCC¹. We also need to secure international commitment to this ambition. We need to develop our understanding of climate change. We are investing in climate change research to underpin our knowledge base.
- 1.6 We want the world's developed economies to cut emissions of greenhouse gases by 60% by around 2050. We will put ourselves on a path towards a reduction in carbon dioxide emissions of some 60% from current levels by about 2050. Until now our energy policy has not paid enough attention to environmental problems. Our new policy will ensure that energy, the environment and economic growth are properly and sustainably integrated.
- 1.7 We can get to a 60% cut in emissions by 2050 in a number of ways. Leaving action until the last minute is not a serious option. If we do not begin now, more dramatic, disruptive and expensive change will be needed later. We need early, well-planned action to provide a framework in which businesses and the economy generally, including the jobs and skills base, can adjust to the need for change, and encourage new technologies.
- 1.8 We have analysed carefully the likely impacts on the UK economy of cutting emissions by 60% by 2050. Our analysis suggests that the cost of effectively tackling climate change would be very small - equivalent to only 0.5-2% of our GDP in 2050 which by then will have tripled compared to now.

¹ United Nations Framework on Climate Change.

- 1.9 Our second challenge is the **decline of the UK's indigenous energy supplies** - oil, gas, nuclear and coal. Much of the UK's economically viable deep mined coal is likely to be exhausted within 10 years. By around 2006 we will also be a net importer of gas and by around 2010 of oil. By 2020 we could be dependent on imported energy for three quarters of our total primary energy needs.
- 1.10 As we shift to become a net importer, we may become potentially more vulnerable to price fluctuations and interruptions to supply caused by regulatory failures, political instability or conflict in other parts of the world. But being an energy importer does not necessarily make it harder to achieve energy security. Of the leading industrial nations only Canada and the UK are net energy exporters. All the others have achieved economic growth as energy importers. We can do the same, as we did before North Sea oil and gas. The best way of maintaining energy reliability will be through energy diversity. We need many energy sources, suppliers and supply routes. Renewables and smaller-scale, distributed energy sources such as micro-CHP and fuel cells will help us avoid over-dependence on imports and can make us less vulnerable to security threats.
- 1.11 Norway will be a major source of our gas imports over the next decade. We also need to look for supplies from elsewhere eg Russia, the Middle East, North Africa and Latin America. This trade will involve relationships of mutual dependence - their energy being as important to us as their income from us is to their prosperity. Our growing interdependence also means that securing reliable energy supplies will need to be an increasingly important part of our European and foreign policy. We will work internationally to promote regional stability, economic reform, open and competitive markets and appropriate environmental policies in the regions that supply most of the world's oil and gas. We have secured a commitment to energy liberalisation in the European Union (EU) for industrial customers by 2004 and overall by 2007. This is vital to improve our own access to diverse sources of supply and to allow UK companies to compete in wider markets.
- 1.12 Our third challenge is the need to **update much of the UK's energy infrastructure** over the next two decades. During the 1990s there was significant new investment in generating capacity, especially gas-fired plant. Some generating capacity has since been mothballed and interest in building new plant, other than renewables, has declined. But further changes are in prospect. European measures to limit carbon emissions and improve air quality are likely to force modernisation or closure of most older coal-fired plant. In the absence of new build or life extensions,



nuclear power's share of electricity production will shrink from its current level: there would be only one plant still operating by 2025. Renewables will become a more significant source of electricity as we seek to tackle climate change.

- 1.13 Over the coming years, substantial investment will be required in other parts of our energy infrastructure. Electricity distribution networks will need to adapt to more renewables and to small-scale, decentralised power generation in homes and businesses. We will need additional connections to gas supplies, both piped and liquefied natural gas (LNG), from a range of sources. In the longer term, as we potentially move to different fuels for vehicles eg compressed natural gas or hydrogen, major investments will be needed in the fuel delivery infrastructure.


The goals of our new energy policy...

- 1.14 As we address these three challenges, we will have four goals for our energy policy:
- to put ourselves on a path to cut the UK's CO₂ emissions by some 60% by about 2050, with real progress by 2020;
 - to maintain the reliability of energy supplies;
 - to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and improve our productivity; and
 - to ensure that every home is adequately and affordably heated.
- 1.15 We believe these four goals can be achieved together. As far as possible we will ensure the market framework and policy instruments reinforce each other to achieve our goals. Energy efficiency is likely to be the cheapest, safest way of meeting all four objectives. Renewable energy will also play an important part in reducing carbon emissions, while strengthening energy security and improving our industrial competitiveness as we develop cleaner technologies, products and processes.
- 1.16 There will inevitably from time to time be tensions between different objectives. There is no simple mechanism for determining the relative 'weights' of differing objectives. But our approach is guided by the following considerations:

- significant damaging climate change is an environmental limit that should not be breached. We need to keep the UK on a path to 60% cuts in carbon dioxide emissions by 2050;
- reliable energy supplies are fundamental to the economy as a whole and to sustainable development. An adequate level of energy security must be satisfied at all times in both the short and longer-term;
- liberalised and competitive markets will continue to be a cornerstone of energy policy. Where the market alone cannot create the right signals we will take steps that encourage business to innovate and develop new opportunities to deliver the outcomes we are seeking; and
- our policies should take account of impacts on all sectors of society. Specific measures will be needed for particular groups of people, for example to support those for whom energy bills form a disproportionate burden.

The fuel mix...

- 1.17 We do not propose to set targets for the share of total energy or electricity supply to be met from different fuels. We do not believe Government is equipped to decide the composition of the fuel mix. We prefer to create a market framework, reinforced by long-term policy measures, which will give investors, business and consumers the right incentives to find the balance that will most effectively meet our overall goals.
- 1.18 We recognise this approach is not enough on its own. In particular, specific measures are needed to stimulate the growth in renewable energy that will allow it to achieve the economies of scale and maturity that will significantly reduce its costs. In January 2000 we announced our aim for renewables to supply 10% of UK electricity in 2010, subject to the costs being acceptable to the consumer. We introduced in April 2000 the Renewables Obligation. We exempted renewables from the climate change levy. By 2010, these measures will provide support to the renewables industry of around £1 billion a year. This is designed to deliver the required expansion in renewables by then. We now set the ambition of doubling renewables' share of electricity generation in the decade after that.
- 1.19 In reducing carbon dioxide emissions, our priority is to strengthen the contribution of energy efficiency and renewables. They will have to achieve far more in the next 20 years than previously. We believe such ambitious progress is achievable, but uncertain.

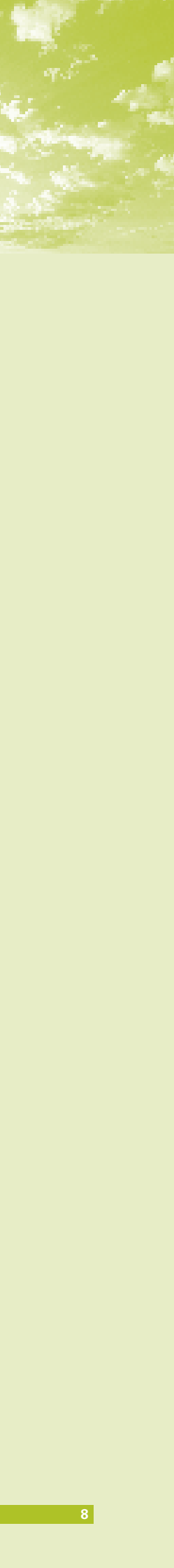
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- 1.20 Nuclear power is currently an important source of carbon-free electricity. However its current economics make it an unattractive option for new, carbon-free generating capacity. There are also important issues of nuclear waste to be resolved, including legacy waste and continued waste arising from other sources. We do not make specific proposals for building new nuclear power stations. However we do not rule out the possibility that at some point in the future new nuclear build might be necessary if we are to meet our carbon targets. Before any decision to proceed with new build there will need to be the fullest public consultation and the publication of a further white paper setting out our proposals.
- 1.21 Coal fired generation will also have an important part to play in widening energy diversity provided ways can be found materially to reduce its carbon emissions. We will continue to support relevant research projects to develop options for cleaner coal technologies and for carbon capture and storage. Domestic coal production is likely to continue to decline as existing pits reach the ends of their geological and economic lives. We will introduce an investment aid scheme to help existing pits develop new reserves, where they are economically viable and help safeguard jobs.

How we will achieve our goals...

- 1.22 To achieve our goal of **reducing carbon** emissions we need to continue to decouple economic growth from energy use and pollution. Since 1970 overall energy consumption in the UK has increased by around 10%, while the size of the economy has doubled. We need to accelerate this trend.
- 1.23 Discussions to tackle climate change beyond 2008-12 will start soon. On the basis of existing policies we expect UK carbon dioxide emissions of some 135 million tonnes of carbon (MtC) in 2020. We expect to aim for cuts in carbon of 15-25 MtC below that by 2020. We believe it is possible to achieve this by reducing our energy consumption, together with a substantial increase in renewable energy. By making our intentions clear we aim to provide the signals needed for firms to invest - and help British manufacturers be ahead of the game in developing green technologies we expect to play a large part in the world's future prosperity.
- 1.24 Central to the future market and policy framework will be a carbon emissions trading scheme. We have already launched our own voluntary UK trading scheme. From 2005 electricity generators, oil refineries and other industry sectors are expected to be part of a much larger EU-wide

scheme. By setting caps on emissions the scheme will provide clear incentives for investment in energy efficiency and cleaner technologies at the lowest cost. We will encourage expanded opportunities for trading at all levels. We will work with our EU partners to extend where appropriate the coverage of the EU scheme in due course. We will consider the issues involved in the linkages between tax and tradable permit schemes further as the EU scheme becomes clearer.

- 1.25 On its own emissions trading will not be enough to deliver our environmental goals. We will need additional measures, for example to stimulate further energy efficiency in business, the public sector and households. Policies to raise the energy efficiency of products and buildings will have an important role. We will develop the present energy efficiency commitment, which requires electricity and gas suppliers to encourage their domestic customers to invest in measures such as cavity wall insulation. We aim to bring forward to 2005 the next revision of the Building Regulations to raise standards for energy efficiency in new buildings and refurbishments. We will push in Europe for higher energy efficiency standards in tradable goods such as fridges and personal computers. We will encourage improvements in efficiency and lower carbon fuels in transport. We will provide further encouragement for renewable energy and infrastructure investment through measures such as capital grants and a more supportive approach to planning. We are increasing the funding for renewables capital grants by £60 million, additional to the £38 million of extra funding announced in the 2002 Spending Review. We will set an example throughout the public sector by improving energy efficiency in buildings and procurement.
- 1.26 Our second goal is to **maintain the reliability of Britain's energy supplies**. This requires action on many fronts. We need the right infrastructure and regulatory system at home and liberalised EU energy markets. We will pursue closer international relationships to promote regional stability and economic reform in key producing areas, mutual understanding of the functioning of markets, and conditions for foreign direct investment to facilitate further infrastructure investment in the world's diverse gas and oil regions.
- 1.27 In liberalised markets, forward prices will send signals about the need for future investment. Suppliers will act on these signals, and on their own assessments of risk and opportunity, to innovate and plan to meet those needs. In response to current market signals some companies already plan to increase gas imports through our pipeline to Belgium; others are exploring options for gas storage and new LNG importing facilities. These



developments help provide reassurance that the market will invest in the capacity we need to provide reliable energy supplies.

- 1.28 Thirdly, we are determined to promote **competitive energy markets**, in the UK and beyond. This will help to raise sustainable rates of economic growth and support our competitiveness through reliable and affordable energy. A competitive energy sector is important to the whole economy's competitiveness and productivity. We need greater resource productivity in business so our firms use energy more efficiently, reduce carbon dioxide emissions and cut costs at the same time. To do that we will encourage firms to innovate and minimise costs and deliver better quality goods and services. We will continue our commitment to competitive energy markets and use market-based instruments to deliver our wider energy policy goals. We will work with business to help them prepare for the low carbon economy and seize the opportunities it provides. Through our new sector skills network we will work with the energy industry to develop the skills industry needs.
- 1.29 Our final goal is to **ensure that every home is adequately and affordably heated**. In 1996, 5½ million households needed to spend more than 10% of their income on heating their homes adequately. Already, falling prices and higher social security benefits have helped reduce this number to around 3 million.
- 1.30 Alongside our policies to cut poverty we need to tackle the problem of old, poorly insulated, draughty homes, where much spending on energy is wasted. In 2001 our fuel poverty strategy set out policies to end fuel poverty in vulnerable households in England by 2010. We further aim that as far as reasonably practical nobody in Britain should be living in fuel poverty by 2016-18. Grant schemes and the energy efficiency commitment are already improving homes through better insulation, more efficient heating systems and minimising draughts. Later this year we will review the results of these policies and decide what more needs to be done to achieve our fuel poverty objectives.

Innovation is fundamental...

- 1.31 Technological innovation will have a key part to play in underpinning our goals and delivering a low carbon economy cost-effectively. We will support research, development and innovation to encourage the development of new, longer-term options such as the hydrogen economy, and where necessary to enable emerging technologies, such as renewables and new energy efficiency technologies. A new national energy research centre will be established by the Research Councils.
- 1.32 We will work through our national programmes, international collaborations and multilateral programmes to enable us to maximise return on our participation. We will work with our G8 and EU partners to develop climate change technologies to help us meet our carbon reduction ambitions and help others, especially the developing world, meet theirs.

Looking to the future...

- 1.33 We need to prepare for an energy system likely to be quite different from today. It will be for the market to develop and invest in this. But we need to set clear goals and a strategy within which the market has the confidence, ability and sense of long-term commitment to do so. Our approach is based on the following key principles:
- energy investments are generally long-term;
 - the cheapest, cleanest and safest way of meeting all our goals is to use less energy. We must improve energy efficiency far more in the next 20 years than in the last 20;
 - a well-designed, transparent and open energy market is the best way of achieving efficient outcomes. We will wherever possible use market instruments to achieve our goals. In particular, emissions trading will be at the centre of our energy markets from 2005 onwards;
 - we will need to continue to use trading as well as other measures to reduce carbon, along with measures to drive up energy efficiency in homes, products and transport;



- the nationwide and local electricity grids, metering systems and regulatory arrangements that were created for a world of large-scale, centralised power stations will need restructuring over the next 20 years to support the emergence of far more renewables and small-scale, distributed electricity generation;
- the future energy system will require greater involvement from English regions and from local communities, complemented by a planning system that is more helpful to investment in infrastructure and new electricity generation, particularly renewables. Strong links with the Devolved Administrations, who are already fully engaged on a wide range of energy issues, will continue to be essential;
- diversity is the best way of protecting ourselves against interruptions of supply, sudden price rises, terrorism or other threats to security of supply. As we become a net energy importer we will need many sources, suppliers and routes. International relations in Europe and worldwide will be increasingly important to achieving our overall energy aims;
- we will seek out the best ways to influence outcomes in line with the principles of better regulation, maximising use of market-based and/or voluntary mechanisms, promoting regulations only where they are clearly necessary and well designed. Where regulation is required we will work to make sure it takes account of the impact on key stakeholders to minimize the burdens particularly on smaller and medium sized enterprises; and
- when designing new energy policies, we will consider their impact on all of our energy policy objectives, in line with our overall approach to sustainable development.

A strategy for the long-term...

- 1.34 We have set out a long-term framework to deliver our environmental, security of supply, competitiveness and social goals. Because energy requires very long-term investment we have looked ahead to 2050 to set the overall context. We have reviewed what we will need to have achieved by 2020 if we are to be confident we are moving in the right direction, fast enough, to deliver our aims for 2050. We have sought to define a long-term strategic vision for energy policy. We have set out long-term strategies and, against that background, shorter-term policies to set us on the path we need to be on. We have not sought to define every detail of the policies we need to pursue over the next 20 years and beyond. That would not be realistic. We need to be prepared, within a firm and clear strategic context, to review the impact of policy changes and to update and amend our detailed policy measures in the light of experience. We believe, for example, that technological innovation will have an important contribution to make in helping to deliver our long-term vision. This will bring new opportunities and possibly new challenges that we cannot imagine now. We have to be prepared to adapt and evolve our policies in the light of those opportunities and wider changes in society. We will strengthen our energy policy capabilities, including annual public reports on progress towards our aims and the steps we are taking to ensure we remain on track.
- 1.35 This will not be the last major strategic statement on energy policy. But it sets a new direction, and a new determination, to deliver very significant changes in both the short and longer terms. It is a massive challenge. But it is one that has to be met. And one we believe we can meet.



The White Paper at a glance...

Chapter 1

Cleaner, Smarter Energy: policies for a low carbon future: new challenges will require a new approach. We set out our energy policy goals and principles that will guide us, based on moving towards a 60% reduction in carbon dioxide emissions by 2050.

Chapter 2

The environment: the threat of climate change requires global action, but we can reduce our carbon dioxide emissions while maintaining our competitiveness, using market mechanisms like emissions trading.

Chapter 3

Energy efficiency can make a big contribution to carbon cuts. We propose action to tighten Building Regulations, improve product standards and encourage greater energy efficiency in homes and offices.

Chapter 4

Low carbon generation can also make a big contribution. We will continue to support renewables and CHP and will work with OFGEM and others to address the burdens on smaller generators. We do not propose new nuclear build or rule it out.

Chapter 5

Transport: we need in the short-term to reduce carbon emissions through better vehicles, and in the longer-term through lower carbon fuels; aviation, shipping and rail can also help.

Chapter 6

Energy reliability is essential. We need energy security at predictable prices through the market. We discuss the domestic and international dimensions of becoming an energy importer, including energy diversity. Coal still has a future using cleaner coal technology.

Chapter 7

Our productivity and competitiveness depends on energy and specifically competitive energy prices, higher resource productivity, promoting enterprise, ensuring we have the right energy skills, promoting energy innovation with higher spending, and encouraging investment.

Chapter 8

Energy and the vulnerable: too many people in the UK cannot afford the energy they need to heat their homes adequately. We must help them, and support people in developing countries that do not have easy access to energy.

Chapter 9

Delivery must be through partnership with other stakeholders, including Devolved Administrations, the regions, local government and business.

A possible scenario for the energy system in 2020...

We envisage the energy system in 2020 being much **more diverse** than today. At its heart will be a much greater mix of energy, especially electricity sources and technologies, affecting both the **means of supply** and the **control and management of demand**. For example:

- Much of our energy will be **imported**, either from or through a single European market embracing more than 25 countries.
- The backbone of the electricity system will still be a market-based **grid**, balancing the supply of large power stations. But some of those large power stations will be **offshore marine** plants, including **wave, tidal** and **windfarms**. Generally smaller **onshore windfarms** will also be generating. The **market** will need to be able to handle intermittent generation by using **backup capacity** when weather conditions reduce or cut off these sources.
- There will be much more **local** generation, in part from medium to small local/**community** power plant, fuelled by locally grown **biomass**, from locally generated **waste**, from local **wind sources**, or possibly from local **wave and tidal** generators. These will feed local **distributed networks**, which can **sell excess capacity** into the grid. Plant will also increasingly generate **heat** for local use.
- There will be much more **micro-generation**, for example from **CHP** plant, **fuel cells** in buildings, or **photovoltaics**. This will also generate excess capacity from time to time, which will be sold back into the local distributed network.
- **Energy efficiency** improvements will reduce demand overall, despite **new demand** for electricity for example as homes move to digital television and as computers further penetrate the domestic market. Air conditioning may become more widespread.
- New homes will be designed to need very little energy and will perhaps even achieve zero **carbon emissions**. The existing building stock will increasingly adopt energy efficiency measures. Many buildings will have the capacity at least to **reduce their demand** on the grid, for example by using **solar** heating systems to provide some of their water heating needs, if not to generate electricity to sell back into the local network.
- **Gas** will form a large part of the energy mix as the savings from more efficient boiler technologies are offset by demand for gas for CHP (which in turn displaces electricity demand).
- **Coal fired generation** will either play a smaller part than today in the energy mix or be linked to **CO₂ capture and storage** (if that proves technically, environmentally and economically feasible).
- The existing fleet of **nuclear** power stations will almost all have reached the end of their working lives. If new nuclear power plant is needed to help meet the UK's carbon aims, this will be subject to later decision.
- **Fuel cells** will be playing a greater part in the economy, initially in static form in industry or as a means of storing energy, for example to back up intermittent renewables, but increasingly in transport. The **hydrogen** will be generated primarily by non-carbon electricity.
- In **transport**, hybrid (internal combustion) vehicles will be commonplace in the car and light goods sectors, delivering significant efficiency savings. There will be substantial and increasing use of **low carbon biofuels**. Hydrogen will be increasingly fuelling the public service vehicle fleet (for example buses) and utility vehicles. It could also be breaking into the car market.
- **Nuclear fusion** will be at an advanced stage of research and development.
- People generally will be much more aware of the **challenge of climate change** and of the part they can play in **reducing carbon emissions**. Carbon content will increasingly become a commercial differentiator as the cost of carbon is reflected in prices and people choose lower carbon options.

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