THE LOW CARBON ECONOMY
SECURITY, STABILITY AND GREEN GROWTH

Protecting Security
Policy Green Paper No.8

conservatives.com
Contents

Foreword by David Cameron 2

Executive summary 3

1. Times change and we need to change with the times 7

2. Labour’s failure to change with the times 10

3. The shape of change 14

4. Transforming technologies 15

5. New networks: transforming the physical infrastructure 26

6. New market signals: transforming the financial incentives 35

7. Putting government’s own house in order 50
Foreword

We have a vision of a different Britain. It is a vision of a Britain in which our cars run on electricity; high speed trains whisk us from North to South in less time than it takes to get across greater London; we produce much more but use much less energy to do it; our power suppliers no longer depend to any great extent on imported oil and gas; our homes require less energy, produce far more of their own energy and are heated by gas we produce from our own agricultural and domestic waste.

It is a vision of a Britain which leads the world in new green technologies. Secured against interruptions of supply and volatile prices, our industry can plan for growth. Our national security is guaranteed, regardless of decisions by volatile governments elsewhere to close pipelines or restrict supply. It is a decentralised vision rather than one in which all decisions about our energy future are vested in the government. Through it we play our full part in protecting our planet against the effects of man-made climate change.

Is this vision shared across the political spectrum? In one sense, I believe it is. Today, all the major political parties agree that this is what we must seek to achieve.

But there is no sign that the present Government have any coherent plan for achieving the technological change that the vision implies. The National Audit Office tells us that present policies will achieve nothing more than a 10 per cent reduction in our dependence on carbon over the next decade. And, during the past decade, the record is even worse: there has been no noticeable change at all in our carbon-dependence. As in so many areas, the Government has failed to fix the roof while the sun was shining.

Why, despite eleven years in power, has Labour failed even to begin decarbonising Britain?

It is a tale of personalities and of bureaucracies - a Chancellor who, for years, stood out against radical change to a low carbon economy; an endless, three-cornered fight between Treasury, DBERR and DEFRA; above all, the absence of any coordinated, strategic plan for action to create a new, low carbon economy. To this day, there is no such plan from Labour.

Here, in this green paper we present such a plan.

It is not a plan to micromanage Britain into a low carbon economy - because we know that governments cannot effectively micromanage radical economic change. We cannot know for sure which technologies will prevail over others, or the choices people will make as to how they live their lives in fifty years time.

But we can plan to do the two things that governments can do to bring about real change in the energy economy – to create new networks, and to create new signals for the market, in electricity, in heat, in transport, in our buildings.

This green paper commits a future Conservative government to establishing the networks and to creating the market signals that will enable the full power of British engineering and British manufacturing to be brought to bear on the decarbonisation of our country.

This is a blueprint for a better energy future.

David Cameron, Leader of the Conservative Party
Executive summary

Britain is now in the grip of a full-blown recession and Labour’s Debt Crisis has put our public finances in chaos, with the worst budget deficit in the developed world.

Conservatives have proposed urgent national economic policy measures, including tough fiscal controls, tax cuts for employers, and a National Loan Guarantee Scheme to help companies stay afloat and keep people in work.

But we cannot simply rebuild our economy as it was, heavily reliant on a few industries and on a narrow range of unstable and carbon-intensive energy sources. The future must be different to the past, and Conservatives understand that we urgently need to make the move to a low carbon economy, for three main reasons:

First, it will strengthen our economy. Decarbonising Britain will help create hundreds of thousands of jobs, raise skills and improve Britain’s competitiveness. These jobs and skills will give new hope to people being hit by the recession. A decarbonised Britain will be a world leader in green technology, engineering, innovation and growth.

Second, decarbonising the economy will help guarantee our energy security. If we continue to rely on imported fossil fuels from Russia, North Africa and the Middle East, then businesses and households will be increasingly at risk of losing their energy supply or paying wildly fluctuating prices. We need a different future where we get our energy from a wider range of more dependable sources and where we encourage innovative energy sources to be developed; where every household and business can play a part in producing energy and where breakthrough technologies are rapidly implemented.

And third, decarbonising our economy will help us protect our environment for future generations. Just as the reckless accumulation of debt in our economy means higher taxes for the next generation; so the reckless accumulation of carbon dioxide in our atmosphere will impose costs on our children and their children. Now that we know the scale of the risks we have created and are creating, it would be selfish, irresponsible and morally wrong not to act now to reduce our carbon emissions and do all we can to protect the future.

The Conservative plan for decarbonising our economy

No-one knows what the future holds. But based on our knowledge today, in 2009, we can make some reasonable estimates about the difference we can make if we implement the big changes set out in our plan for a low carbon economy.

If we implement our plan for decarbonising the economy now, we believe that by 2050:

- Britain’s lighting and electronics, and most of our machinery, trains and cars can be powered by low carbon electricity provided through a new electricity internet;
- we can be tapping new, abundant low carbon energy sources like tidal power and biogas and using the energy produced not just to deliver electricity but also to warm our homes and provide heat for our communities;
- our homes and businesses can be dramatically more energy efficient;
- we can be much less dependent on imported fossil fuels from volatile regions of the world, and as a result much more secure;
- we can meet our target to reduce emissions by 80% over 1990 levels;
- we can turn Britain into the world-leading economy for green innovation and technology, and
- we can enhance our competitiveness through a significant reduction in the amount of energy required to manufacture products, to provide services and to live and work in the United Kingdom.
• We are certain that we can build this secure, green prosperous future, but only if we start the work of transforming our national energy infrastructure now.

An electricity internet

The way our energy is produced and transmitted around the country is stuck in the 1950s and '60s: the era of centralised command and control. Highly engineered plants using mainly post-war technologies transmit electricity across ‘dumb’ networks which cannot intelligently manage the load on them to reflect the capacity available. It is akin to an analogue system – with little scope for interactivity between producer and consumer, and little opportunity for personalised control or responsibility.

The changes we want to make are genuinely revolutionary. They involve putting computing intelligence into electricity networks, through the introduction of a smart grid and the use of smart meters in people’s homes, so that demand and supply can be intelligently managed. Communications technology has now made this type of interactivity commonplace in many aspects of our lives – but not in energy. The change is as big as the one from the plain old telephone system to the internet – a quantum leap in energy transmission and distribution where simple, slow signals are replaced by highly sophisticated exchanges between consumers and producers, transforming the efficiency and effectiveness of the national grid. That is why we call it the electricity internet.

Moving to an electricity internet unlocks many opportunities. Large-scale use of renewables becomes feasible because a smart grid can manage domestic and commercial appliances to use more energy when it is abundant and less at peak times. The vast and barely exploited renewable resources that Britain has in abundance – tidal power, offshore wind, wave energy – can be exploited and fed into the national grid.

The electricity internet, like the world wide web, also unleashes the possibility of anyone who wants to contribute being able to do so. Homes and businesses, schools and hospitals, will be able to contribute energy from their own small-scale low carbon energy production – or micro-generation – via their smart meters, earning money in the process.

Participation in the interactive, intelligent management of load via the smart grid will be voluntary; the customer will choose. But those that take up the opportunity will see their energy bills fall while their standard of living rises, as they take much greater control of their energy use.

And the electricity internet won’t just change the energy and power we don’t see, it will change the way we live our lives on a daily basis. Just a few years ago zero-emission cars were a pipe-dream, to be seen on Tomorrow’s World but not on Top Gear, but a new smart grid enables the installation of plug points in streets, heralding a new era of electric and plug-in hybrid cars which will clean up pollution and cut the cost of motoring. The electricity internet will transform the way we think about power.

Our proposals

To achieve this transformation we will:

• transform electricity networks with ‘smart grid’ and ‘smart meter’ technology so that the use of electricity for a wide range of household and workplace appliances, and the charging of electric and plug-in hybrid cars, can be tailored automatically to match the supply of electricity - permitting in turn a huge increase in renewable power;

• create a decentralised energy revolution by introducing a system of ‘feed in tariffs’ for electricity generation to multiply electricity production from micro-generation;

• vastly expand the amount of offshore wind and marine power by giving the National Grid the incentive to construct a new network of under-sea Direct Current (DC) cables and banding the Renewables Obligation to support these technologies; and
• introduce incentives for electricity network operators to establish a new national recharging network, enabling Britain to lead the world in replacing traditional cars with electric and plug-in hybrid vehicles.

New low carbon energy sources

In a world of declining North Sea production and unstable fossil fuel supplies, we need to diversify our energy sources and use technological innovation to unlock the potential of existing but untapped sources of energy. Labour have failed to invest sufficiently in the development of new energy technologies and have not done enough to break down the regulatory barriers that are stopping these innovations. Keeping our energy secure and kicking our addiction to carbon go hand in hand, so our plan for a low carbon economy will enable new, exciting and practical technologies to come on stream.

By adding carbon capture and storage to every new coal plant we’ll be able to take the most highly polluting, high carbon producing fuel of all and transform it into a low carbon fuel of the future. Britain is blessed with large coal reserves, so there will be big benefits for our economy too in cleaning up coal power.

We can greatly reduce our dependence on imported gas by introducing new biogas plants. Instead of rubbish and farm-waste going to landfill and slurry tanks, it will be turned into low-carbon, low emission biogas. This new biogas will be fed into the gas grid or used to supply heat to community heating schemes which, by cutting the amount of energy lost in power generation, will dramatically cut costs for residents who take part.

Local heating schemes could also be fuelled by second-generation biofuels. Because they are derived from agricultural waste and non-food crops, they will bring an end to the current problem where increased use of biofuels raises food prices, hitting consumers in the pocket.

And by speeding them through the planning process new Marine Energy Parks will spring up around our coastline, developing different ways of harnessing tidal and wave power for energy production.

Our proposals

To bring new energy sources on stream we will:

• enable biogas – methane produced from the anaerobic digestion of farm and food wastes – to replace up to 50% of our residential gas heating by changing the regulatory regime for the gas grid and introducing ‘feed-in tariffs’ for biogas;

• incorporate carbon capture and storage equipment into at least 5,000MW of new coal-fired power plants so that they can be capable of meeting an Emissions Performance Standard restricting carbon emissions to the level achieved by a modern gas power plant;

• support all forms of low carbon heat generation and give local authorities powers to establish new Combined Heat and Power district heating networks;

• create binding sustainability rules for existing biofuels and establish a more ambitious Renewable Transport Fuel Obligation to promote the development of sustainable second-generation biofuels;

• clear the way for new nuclear power stations through the establishment of a National Nuclear Waste Site and type approvals for nuclear stations; and

• provide government backing, through fast-track planning, for a network of large scale Marine Energy Parks.
Low carbon buildings, transport and commerce

Becoming a low carbon economy is not just about developing the new energy generation technologies of the future. It is also about taking action now to reduce emissions from the principal non-energy sources of carbon, namely housing, industrial buildings, transport and household goods.

Changes to household insulation can have such a dramatic effect on energy consumption that it’s possible to fit out a home with energy saving equipment and for the household to still save money on their bills immediately. Only the apathy and lack of imagination of the Labour Government is stopping us doing this now. Making it happen will create thousands of jobs during the recession.

As well as families seeing savings on their bills, using smart meters and energy use comparisons they’ll also be able to know whether they are consuming more than average and find ways to reduce consumption further. In many cases, they’ll be able to ask their employer to pay for these changes and the employer will be able to earn emissions credits for doing so, helping them fulfil their energy saving obligations.

And we’ll make sure the goods and services we use every day get more and more efficient, adopting from Japan a scheme that produces a rising bar of energy efficiency for all appliances, and building a modern and efficient high speed rail network.

Our proposals

To start cleaning up our emissions now we will

- introduce a new entitlement for every home to be fitted immediately with up to £6,500 of approved energy efficiency improvements, the cost to be repaid through fuel bills over a period of up to 25 years but delivering immediate reductions in the gas and electricity bills of participating households;
- mandate energy suppliers to ensure that every gas and electricity bill contains energy use comparison information;
- introduce new rules that allow employers to meet carbon reduction requirements by sponsoring energy efficiency improvements in their employees’ homes;
- establish a new ‘top runner’ scheme to highlight the most energy-efficient household goods;
- fully implement the Energy Performance in Buildings Directive and require Display Energy Certificates for public and private non-domestic buildings over 1000 square metres; and
- immediately start work on establishing a new high speed rail network linking cities in the North and South, boosting economic regeneration and jobs, and removing the need for a third runway at Heathrow.
1. Times change and we need to change with the times

Our starting point in thinking about the low carbon economy is hope, not despair. We are talking about a technological transformation that will enable us to fulfil the aspirations of our people for a rich, varied and prosperous life with vastly reduced dependence on hydrocarbons. This is not a dream of a return to the simplicity of the middle ages. Nor is it mission impossible. It is, on the contrary, a pragmatic programme to ensure that new technologies make it possible to live as we want to live without relying on hydrocarbons in the way we currently rely on them.

The activities down the pathway to the UK becoming a low carbon economy should be seen as a sort of insurance premium. They buy us protection against the hazards of the future and they will pay dividends even if the gloomier predictions about global warming are not fulfilled – dividends in the form of more stable energy costs, improved economic competitiveness and increased energy security.

1.1 A new source of UK economic growth

‘A paradigm shift to a low carbon economy by 2050 has the potential to drive forward the next chapter of technological innovation. It will require a third – this time a green – industrial revolution’. This was the advice of the World Economic Forum to G8 Leaders in July 2008.1 Just as the ‘Big Bang’ of financial reforms in the 1980s led to London becoming the premier international financial centre that it is today, we now need a ‘Big Bang’ of low carbon economic reforms, creating business opportunities for Britain.

The Stern Review estimates that new climate change related markets will be worth over $500 billion a year by 2050 and, according to New Carbon Finance, global investment in new energy alone amounted to $100 billion in 2006 with 65 per cent of this managed out of the City of London. Current investment trends show that the most successful and progressive companies are already embracing this agenda with far more ambition than the present Government. BP has demonstrated that focusing on energy efficiency within its own business can add substantially to the bottom line – over $650 million to date. Over 15 years, Dupont has reduced its global energy consumption by 7 per cent, reduced its emissions by 70 per cent and, in the process, saved the company $2 billion.

1.2 Energy and competitiveness

The Conservative Economic Competitiveness Policy Group launched its report, Freeing Britain to Compete, in August 2007. The report’s comprehensive analysis of the state of the British economy warned that ‘barring radical action, the UK’s hydrocarbon dependence will keep growing’.

As Figure 1.1 shows, the UK is towards the bottom of the table in ‘hydrocarbon independence’ amongst the major energy consuming countries – far below France, Canada and Japan. And this graph excludes wind, geothermal, solar and biofuels – in which Britain also lags.

---

1 The Guardian, ‘Biggest firms call for huge cuts in emissions to start green industrial revolution’, 20 June 2008
Freeing Britain to Compete emphasised the dangers to our economy of relying on hydrocarbons for over 90 per cent of the UK’s energy requirements. The report warned that Britain’s lack of a diversified energy base could make its energy-intensive industries uncompetitive, if the hydrocarbon and carbon costs both moved the wrong way.

Since the publication of the report, we have seen oil and gas prices fulfil the worst fears of its authors. The effects of excessive dependence on oil and gas for the British economy in terms of price volatility and long-term upward trends in price are now beginning, at last, to be widely understood.

1.3 Energy security

In July 2007, the Conservative National and International Security Policy Group published its report, An Unquiet World. This was the first report from a major political party in Britain to highlight the need to ensure ‘security of energy supply to British consumers’. The report emphasised that ‘the world’s supply of fossil fuels is not keeping pace with the secular rise in demand which results from the rapid global economic growth of recent years’ and went on to identify ‘a considerable degree of political risk’ that arises from ‘the major fields being in some of the most politically unstable parts of the world’. The report recommended, on security grounds, the same policy as advocated by the Conservative Economic Competitiveness Policy Group – ‘an active policy… to reduce UK oil and gas dependency’.

It is no surprise that the Conservative National and International Security Policy Group reached this conclusion. At the same time as the UK’s hydrocarbon dependence grows, the reserves of oil and gas in the North Sea on which the UK relies to meet its energy needs have been steadily eroded. The UK became a net natural gas importer in 2005 and moved to a net deficit in oil in 2006. The deficit will rise sharply, reaching 39 per cent of oil and gas demand by 2010, a trend that will be aggravated as coal and nuclear capacity are decommissioned. On current policies, it is likely that we will be importing up to 80 per cent of our energy from 2020.

---


3 Economic Competitiveness Policy Group, Freeing Britain to Compete: Equipping the UK for Globalisation, August 2007, page 108.

4 Gordon Brown, speech to the WWF, November 2007. The latest projection by the National Grid (Gas Transportation Ten Year Statement 2007) is that the UK may have an import requirement of 51 per cent by 2010/11 and 79 per cent by 2016/17.
Our gas dependency is particularly worrying. Gas represents more than a third of our energy mix today, up from 10 per cent in 1970. And as Britain’s demand grows, so does our dependence on foreign imports. It is likely that the UK will have to import around 80 per cent of its gas by 2016/2017.

This new dependence on foreign fossil fuels means that the UK is now more exposed to three major national security risks:

- vulnerability to geo-political rivalry and Russian interruption of supply;
- exposure to the effect of international conflict on the supply and price of oil; and
- exposure to terrorist attack on a small number of import facilities.

To address these security challenges we need a transformation, shifting our energy dependency away from fossil fuels.

Diversity is the first principle in this transformation. Just as Churchill said at the height of the hydrocarbon age that ‘safety and certainty in oil lie in variety and variety alone’, so in the post-hydrocarbon age, we need to encourage a wider range of energy mixes in order that our society can be secure.

1.4 Social justice

When families are being hit hard every time they pay their gas bill, fill up their cars or do the weekly shop, we can all see the advantage of moving to low carbon sources of energy and improving efficiency.

During tough economic times, the cost of living is the number one concern for Britain’s families. Rising energy prices affect us all. But they hurt the poorest the most. In July 2008, British Gas’s parent company, Centrica, revealed that gas prices are expected to rise considerably in coming years – annual average gas bills could rise from £600 to more than £1,000 early in the next decade if current trends persevere.

The only way to prevent sharp increases of fuel poverty at times when oil and gas prices rise, is to make domestic heating and domestic electricity far less dependent on fossil fuels. Radical measures to improve the energy efficiency of the whole housing stock, allied to profound changes in the sourcing of heat and electricity are needed if we are to avoid more and more people falling into fuel poverty over coming years.

1.5 Climate change

Our economic stability, our energy security and our desire for social justice all argue for a radical shift away from dependence on fossil fuels. But there is also, of course, an environmental reason for shifting away from hydrocarbons. As Blueprint for a Green Economy – the report of the Conservative Quality of Life Policy Group – pointed out in September 2007, reducing UK carbon emissions is an important contribution to reducing the global risk of climate change.

Britain’s greenhouse gas emissions have risen since 1997, with an 8 per cent increase in emissions between 1999 and 2004.

---

5 Department of Business, Enterprise and Regulatory Reform, Digest of United Kingdom Energy Statistics 2007, page 304
8 Department of Environment, Food and Rural Affairs, Sustainable development indicators in your pocket, page 30.
The end of the 20th century saw a ‘dash for gas’ brought about by the policies of economic liberalism employed by the Conservative Party in government. This resulted in a reduction in the UK’s carbon dioxide emissions from over 590 million tonnes in 1991 to a low of 540 million tonnes in 1999.

A similar ‘dash for a low carbon economy’ by the next Conservative government will not only result in a reduction in carbon emissions but establish an international leadership role in the global low carbon economy of the future.

Leadership at home will also strengthen the UK’s role in international negotiations for climate change agreements. David Cameron’s support for a Climate Change Bill was pivotal in ensuring that the Bill was included in the 2006 Queen’s Speech. The Climate Change Act gives Britain the opportunity to take a lead in securing a global agreement to make the world greener and safer.

Some people remain sceptical of the majority of scientific opinion that suggests that climate change is real, immediate, and one of the greatest challenges facing the world today. But a prescient speech by Margaret Thatcher in 1990, one of her last speeches before leaving office, makes it clear that the actions that should be taken to reduce CO₂ emissions are in our interest anyway⁹:

‘Many of the precautionary actions that we need to take would be sensible in any event. It is sensible to improve energy efficiency and use energy prudently; it's sensible to develop alternative and sustainable energy sources; it's sensible to replant the forests which we consume; it's sensible to re-examine industrial processes; it's sensible to tackle the problem of waste. I understand that the latest vogue is to call them ‘no regrets’ policies. Certainly we should have none in putting them into effect’.

⁹ Margaret Thatcher, speech to 2nd World Climate Conference, 6 November 1990.
2. Labour’s failure to change with the times

2.1 Britain’s’ continued dependence on fossil fuels

The Government has committed itself to various national and international targets for reducing UK greenhouse gas emissions. These include:

- the UK Kyoto target of a 12.5 per cent reduction in greenhouse gas emissions by 2008-2012 against a 1990-1995 baseline;
- three UK domestic goals, all against a 1990 baseline, – a 20 per cent reduction in carbon dioxide by 2010, ‘real progress’ by 2020, as well as ‘at least’ an 80 per cent reduction by 2050; and
- a new structure, set out in the Climate Change Act, for translating into statute the 2020 and 2050 goals – including the introduction of a system of five year carbon budgets and a 34 to 42% per cent reduction by 2020.

But these targets have not been matched by effective action. Carbon emissions have risen in four of the last seven years, including 2006, and have essentially flat-lined since Labour came to office in 1997, as illustrated by Figure 2.1:

![Figure 2.1: UK carbon dioxide emissions, 1990-2012](source)

Given that targets alone have not worked, new policies are clearly needed if the framework for emissions reduction, set out in the Climate Change Act, is to stand any serious chance of being realised.

---

13 Department of Environment, Food and Rural Affairs, UK announces measures to move to low carbon economy, press release, 26 June 2006.
14 Climate Change Act 2008.
This need for a change of policy is admitted by the Government itself. Giving evidence to the Environment Audit Committee, the Secretary of State for Defra, Hilary Benn, commented that: ‘We are not making fast enough progress on our own carbon reduction targets… In truth, it is a reminder to all of us that we have a very big task on our hands and we need to make faster progress’.

Figure 2.2 provides an indication of how far the UK needs to go in order to meet even the previous 60% emissions reduction target by 2050, with a significant proportion required from buying foreign credits.

![Figure 2.2: Original UK carbon dioxide targets set by the Climate Change Bill](source)

Source: UK greenhouse gas emissions: measurement and reporting (March 2008) National Audit Office

Note: The forecast for UK emissions – from the Government’s Updated Energy Projections (UEP) – is based on assuming central impact of Energy White Paper measures and an oil price of $70 per barrel increasing to $80 by 2020. It does not include the impact of any additional policies which might be introduced (including Phase 3 of the EU ETS).

2.2 Why the low carbon revolution is not happening

Unfortunately, there is little sign of a coherent and effective programme to address these policy deficiencies. In particular, the Government is:

- failing to accelerate funding for vital technologies such as carbon capture and storage (CCS). Indeed, CCS fails to qualify for the Government’s main green energy handout and confusion over Government policy and timescales has meant that the number of proposed CCS projects has halved in the past year;\(^\text{16}\)

• failing to encourage adequate investment in renewable energy, despite a pledge to commit to a 15 per cent renewable energy obligation by 2020. Notwithstanding a coastline which gives rise to the best wind, wave and tidal assets in Europe, the UK is currently bottom of the EU league table for renewable energy. We have the most expensive wind energy in Europe and the very little renewable energy we do possess costs British taxpayers £1.4 billion per annum17; and

• failing to give the incentives necessary to make a step change in household energy efficiency, despite the promise in 1995 that a Labour government would lead a major push for energy efficiency in the home.18 Giving evidence to the House of Commons Environmental Audit Committee, the Association for the Conservation of Energy remarked that: ‘The energy efficiency industry as a whole is extremely disappointed by the painfully slow progress towards introducing new economic instruments to improve household energy efficiency. Frankly, we are beginning to wonder whether it will happen or whether the Treasury lingers under the illusion that running consultation exercises on a regular basis is the full extent of the commitment required from them’.19

Part of the problem has been insufficient engagement of civil society – including local government, business leaders, local communities and individuals – leaving people disempowered and disconnected. There has been a fundamental failure to engage the British people with a vision of how we can all make a difference and why it is in our interest collectively to act now.20

Moreover, the Government is failing to set a proper example. Both the Environmental Audit Committee and the Sustainable Development Commission have criticised the fact that the Government estate emits over 800,000 tonnes of carbon per year. Although three Departments have met the (rather undemanding) target set for energy efficiency of a 15 per cent increase by 2010/2011, energy efficiency across Government as a whole has improved by only 2 per cent since 1999/2000.21 As Jonathan Porritt, Chairman of the Sustainable Development Commission, argues: ‘Overall, Government performance is simply not good enough. Against a background of non-stop messages on climate change and corporate social responsibility, the Government has failed to get its own house in order. It’s absolutely inexcusable that Government is lagging so far behind the private sector, when it should be leading the way’.22

The bottom line is that, despite considerable rhetoric and the adoption of targets, dependence on fossil fuels has not fallen since 1997. Labour has failed to live up to its own rhetoric.

17 The cost per tonne of carbon dioxide is a £110.47 against an EU ETS average price in 2006 of £11.50 per tonne of carbon dioxide equivalent. World Bank, State and Trends of the Carbon Market, 2007.
19 Evidence to the House of Commons Environmental Audit Committee, January 2006.
20 MORI, The Day After Tomorrow: Public Opinion on Climate Change, May 2004: “Research for the University of East Anglia’s Centre for Environmental Risk found that few people (8 per cent) feel the Government provides all relevant information about climate change to the public. Recent research has shown that four in five (79 per cent) have never heard of the Carbon Trust, the organisation set up by the Government in 2001 to help businesses and the public sector reduce carbon emissions. This reflects the targeting of the Trust’s advertising and media campaigns at businesses and the public sector.”
3. The shape of change

3.1 Our goals: everyone’s business

There is a clear environmental, economic and social case for coherent and effective action on hydrocarbons. But that action cannot be taken by government alone. The Confederation of British Industry is right to argue that a major shift to low carbon energy sources is an urgent and shared national priority. Every part of our society must play a role – not only central government, but also business, local communities, families and individuals themselves.

The business community is already, in many respects, ahead of the Government in taking a lead in reducing pollution, improving energy efficiency, recycling waste and communicating with the public. But business leaders need – and have repeatedly called for – a robust long-term policy framework to give them, and their investors, certainty and confidence when taking major investment decisions.

3.2 Principles of change

The purpose of this Green Paper is to describe how a Conservative government will provide a coherent policy framework within which the nation as a whole can take the steps necessary to establish a low carbon economy.

In *The Wealth of Nations*, Adam Smith (usually regarded as the apostle of the free market), emphasised that one of the duties of government ‘is that of erecting and maintaining those public institutions and those public works, which though they may be in the highest degree advantageous to a great society are, however, of such a nature, that the profit could never repay the expense to any individual, or small number of individuals; and which it, therefore, cannot be expected that any individual, or small number of individuals, should erect or maintain’. And Adam Smith went on to specify ‘the erection and maintenance of…good roads, bridges, navigable canals, harbours, etc.’ as examples of such ‘public works and institutions’.

The role of government in fostering the transformation that will give us the low carbon economy on which our security and competitiveness rests, is one that Adam Smith would have recognised. It is to:

- ensure that the roads to a low carbon economy are built, and to
- give people the right incentives to travel the right way.

Instead of a multitude of conflicting schemes and initiatives, created by a centralised bureaucracy and aimed at micromanaging our way towards a low carbon future, what we need is to establish the open networks that a low carbon economy requires, and to provide incentives with the right signals for change towards a low carbon future. Once those networks and those incentives are in place, the market will bring forward the new technologies.

In the remainder of this paper, we describe the transforming technologies that are already in view; we identify the new networks that are needed; and we describe the new incentives that a Conservative government will introduce. We consciously challenge mythologies that are widespread but unfounded – including the myth that all serious energy production must be centralised; the myth that wind-power and tidal energy require vast amounts of fossil-fuel backup; the myth that there is no adequate substitute for helter-skelter expansion of domestic and European air-travel; and the myth that coal cannot be a low carbon alternative to oil and gas.
4. Transforming technologies

There has been a tendency on the part of some enthusiasts for particular technologies to describe ‘their technology’ as ‘the answer’, and to deride all other technologies as inadequate or counter-productive. We regard this approach as fundamentally misconceived. Nobody in the world – and certainly no politician or government – is in a position to predict all of the technological advances that we shall see over the next forty years as we make our way towards the goal of a low carbon economy by 2050. Nor is it the task of politicians or governments to ‘pick winners’. It is evident that each low carbon technology has limits of one kind or another – and there is every reason to suppose that a low carbon economy (as well as our long-term security) will be achievable only through the use of a wide range of differing techniques.

Nevertheless, it is important that, in designing a policy framework which will provide the physical networks and the market signals that a low carbon economy requires, we should have clearly in mind the wide range of proven and emerging low carbon technologies.

4.1 Transforming technologies in electricity

Carbon capture and storage

In purely economic terms, coal is currently a competitive resource for electricity generation in the UK. As Figure 4.1 shows, coal prices have not risen as fast as gas prices for UK generators over the last eleven years:

![Figure 4.1.1: Average price paid in real terms by UK power producers for coal, oil and natural gas, 1996-2007](source: Quarterly Energy Prices (March 2008) DBERR)

This presents the UK with a challenge. According to Government statistics, 40 per cent of the UK’s annual emissions come from the electricity supply industry, much of this caused by the ‘roll to coal’. Although new ‘supercritical’ coal-fires power stations are more efficient and cleaner than older coal

---


24 A ‘supercritical’ turbine uses a higher temperature resulting in less energy loss than a traditional coal power plant.
technologies, they are still carbon-intensive, not only in comparison with renewables but also in comparison with modern gas-fired power stations.

We are on the brink of accessing a technology that could change our relationship with coal: carbon capture and storage (CCS). By equipping new supercritical coal-fires power stations with proper structures for capturing carbon, it is estimated that in the long-term up to 85 per cent of a plant’s carbon dioxide emissions could be stored safely.\(^{25}\) If CCS technology is successful, coal can play an important part in our transition to a low carbon economy. It can give us diversity of supply, importing coal from countries other than those which supply oil and gas; and it can increase our long-term security – through the potential for exploiting the UK’s large indigenous coal supplies if and when world prices and/or world supply constraints make that desirable.

The UK is uniquely placed to show global leadership on this issue. Our expertise in harvesting natural resources in the North Sea has given us the technical skills along with plenty of candidate sites for geological storage of carbon dioxide, potentially with sufficient capacity for 1,000 years of UK carbon emissions.\(^{26}\) We have a world class manufacturing sector and an energy industry that has shown itself willing to make significant investment. With global coal consumption increasing rapidly, the returns for the UK could be very considerable.

After investigating the potential of CCS, the House of Commons Science and Technology Select Committee concluded in 2006 that: ‘Multiple full scale demonstration projects using different types of capture technology and storage conditions are urgently needed’.\(^{27}\)

In November 2007, despite the Science and Technology’s Select Committee’s recommendation, the Government announced a CCS competition for only a single 300MW demonstration plant. Picking one winner for a small-scale demonstration project reveals a profound lack of ambition and fails to create an adequate framework for the transition to low carbon generation. Clearly, a more effective framework for developing our CCS potential is required.

**Marine power**

Another huge, indigenous (but largely unexploited) national resource is the power latent in the waves and tides of the seas that surround our small island. Britain is well-endowed with these latent resources: wave farms could generate 50 terawatt-hours (fifty billion kilowatt-hours) per year, and tidal stream installations a further 18TWh\(^{28}\). There is now the prospect of tapping this immense energy through a variety of new technologies.

A world first was achieved when Pelamis, a marine energy converter developed by Edinburgh-based Pelamis Wave Power, generated electricity for the National Grid from the European Marine Energy Centre’s wave test site off Billia Croo, Stromness with a capacity of 3 MW and costing £4 million.

A second test site for tidal devices off the island of Eday has recently been opened with the first developer, Dublin based OpenHydro, already installed.

The Severn Estuary has the second largest tidal reach in the world and ideas about using technology to harness the potential electricity from it date back to the first half of the nineteenth century. The Government announced a feasibility study in January 2008 into the potential of the Severn Estuary to be used for the generation of electricity. It is expected to last two years and to cost £9 million and will


\(^{26}\) British Geological Society, 1995, with updated calculations based on current UK power generation emissions


be split in two stages with the publication of interim findings this year and a final report in the first half of 2010, both for public consultation. It aims to assess ‘in broad terms the costs, benefits and impact of a project to generate power from the tidal range of the Severn Estuary, including environmental, social, regional, economic, and energy market impacts. It is also meant to identify a single preferred tidal range project (which may be a single technology, a single location or a combination of these) from the number of options that have been proposed’.29

Another possibility is harnessing tidal power through tidal lagoons – offshore structures built of rock, sand and gravel and fitted with conventional low-head hydroelectric generating equipment that use the rise and fall of the ocean’s tides to generate electricity.

Projects are under development in Canada (280 MW) and Mexico (500 MW) with Tidal Electric Ltd., who believe that they could provide around 33TWh of electricity from a series of lagoons in the Severn Estuary – about twice that which would be provided by a barrage – with possible environmental and economic advantages. Tidal lagoons may also be able to provide pumped storage for wasted night time nuclear power and for unpredictable wind power.

Wind power

The UK electricity supply industry already has 2.6GW of installed onshore large-scale wind generating capacity. A further 7.1GW of large-scale onshore wind generating capacity is currently awaiting planning permissions; an additional 3.4GW has received planning permission but has not begun construction; and another 0.8GW has planning permission and is under construction30.

The UK is also at last emerging as a primary location for investment in offshore wind, though the total amount is still small – in 2008 we overtook Denmark as the country with the most offshore wind capacity.31

In December 2007, the Government announced plans for a major expansion of offshore wind, opening up the UK’s seas to 33GW of offshore wind energy – 25GW by 2020 in addition to the 8GW already planned and anticipated to be operational by 2014.

The potential contribution of both onshore and offshore wind power has been questioned by some commentators, who are concerned about load factors (the amount of time each year during which wind generators are able to produce power), the need for back-up from other sources of power during periods when the wind is either too low or too high, and the economics of (in particular) offshore wind. In addition, it is widely (and we think correctly) believed that the current Renewables Obligation Certificates regime has generated undue returns for some onshore wind generators and this has been matched by under-rewarding incentives for offshore wind. Meanwhile, other commentators have expressed scepticism about the extent to which the Government’s ambitious plans for large-scale offshore wind development can in fact be realised on the basis of the regulatory and other proposals so far put forward by the Government.

In Sections 5 and 6 of this green paper, we set out the steps we believe are required to change physical networks and market signals in such a way as to meet these challenges. Provided that such changes are made, we believe that both onshore wind and offshore wind have a significant role to play in providing Britain with a low carbon electricity supply industry.

29 Department of Business, Enterprise and Regulatory Reform, _Severn Tidal Power Q&A_, page 6.
Nuclear energy

Alongside coal plants equipped with carbon capture and storage and the harnessing of marine and wind power, a fourth major potential contributor to large-scale low carbon production of electricity is new nuclear power.

As current nuclear power stations are decommissioned over coming years, we recognise that new nuclear stations, replicating stations that are operating successfully in other parts of the world, have a part to play if they are economically viable. We have accordingly supported the development of ‘type-approvals’ by the Nuclear Installations Inspectorate, which will ensure that safety standards are applied in a consistent manner so that investors can have confidence that specific existing types of nuclear plant will be licensed for replication in the UK. And we have also supported changes which will ensure that planning enquiries are conducted on the basis of genuine planning considerations rather than involving an entire national energy review that lasts for many years. A further crucial element must be the identification of a safe waste site and a guaranteed regime for handling nuclear waste, which ensures that the costs of decontamination and storage are fully met by the nuclear stations themselves – in line with the recommendations of the Committee on Radioactive Waste Management.

Small-scale decentralised electricity generation

In addition to the provision of large-scale low carbon electricity production, we can increasingly use new techniques to generate electricity on a small-scale. The principal small-scale low carbon technologies that can play a part in decentralised electricity generation are:

- combined heat and power;
- biomass generators;
- energy-from-waste;
- photovoltaic panels; and
- micro-hydro.

Combined heat and power (CHP) generators typically use natural gas to produce electricity in the same way as a conventional generator – but with the waste heat retained and used to warm buildings or to provide hot water. Instead of converting only 55 per cent of the input energy into usable electricity (like a conventional generator), CHP generators can convert as much as 85 per cent of the input energy into usable electricity and heat. This significantly reduces the amount of energy consumed and the amount of carbon emitted in the production of a given amount of electricity and usable heat. But CHP is efficient only if the generator is decentralised and positioned close to the point where the heat is being used, since much of the heat would otherwise be lost in transmission across long distances.

Biomass generators use organic matter to produce energy. Because the plants or trees that are used to power biomass generators absorb carbon dioxide while they are growing, the process as a whole is virtually carbon-neutral. But biomass generation is efficient only if the (heavy and bulky) organic matter that is burned does not need to be transported long distances. Biomass is particularly suited to a decentralised electricity architecture, within which the generating machines (which can range in scale from the size of a garden shed to the size of a barn) can be located on or near to the farms where the plants or trees are grown.

It is widely accepted that minimising residual waste through prevention, reuse and recycling is an important element in preventing landfill and the resulting methane emissions, and in making the economy more energy and resource-efficient. It is also, however, accepted that, at least in the short term, there will be residual waste that will have to be disposed of in some way. Several treatment technologies produce residues that still contain energy. For example, the residue from mechanical

---

biological treatment can retain a high calorific value. Other technologies, such as anaerobic digestion, generate energy without burning the waste material being processed. Heat generating incinerators, in which the heat as well as the power is recovered, are also capable of operating more carbon-efficiently. Some energy-from-waste technologies, such as anaerobic digestion, can be small-scale and flexible with proven carbon benefits, whereas others may be large and inflexible. The efficiency of incinerators is key, and – to qualify as a low carbon energy source, energy-from-waste must make use of non-recyclable materials (so as to avoid crowding out waste prevention or recycling), must provide efficient energy recovery meeting at least the EU’s proposed energy efficiency thresholds and must meet appropriate emissions standards on the basis of transparent emissions reporting.

Photovoltaic panels (PV) are low carbon generators which convert sunlight into electricity. They do not require direct sunlight and will operate throughout the year, although as the map below shows, they are more likely to provide efficient generation in southern parts of Britain. Their costs have been falling fast, as the technology develops and efficiency improves. Decentralised PV is also highly efficient in its use of space since it can be built into new homes or other buildings or can be bolted onto existing buildings (for example, when roofs are replaced). In the right locations, about 40 square metres of PV panels – roughly the size of a normal roof – can supply all the electricity for a medium-sized house.33

![Figure 4.1.2: Yearly total of global horizontal irradiation (kWh/m2) UK and Ireland](image)

---

Hydro-electric power currently provides around 0.8 per cent of total UK electricity supply, mostly from large-scale hydro-electric schemes in the Scottish Highlands.\textsuperscript{34} But, in a decentralised system, micro-hydro-electric generation can be introduced, making use of the power from smaller rivers and mill-streams which are not sufficiently powerful to sustain major hydro-electric dams. Rivers with a fall (or ‘head height’) of three metres or more can support such generation – which can be used to provide low carbon electricity for neighbouring areas.

4.2 Transforming technologies in gas and heat

Biogas

Biogas is an inherently renewable and environmentally-friendly source of energy that can make a significant contribution to the UK’s future energy needs, as part of a progressive shift to a low carbon energy system.

Biogas typically refers to methane produced by the anaerobic fermentation of organic matter including farm and food waste, crops, silage, manure or any other biodegradable feedstock. It is comprised primarily of methane (typically 55 to 75 per cent). It is produced when organic matter such as farm and food wastes decomposes in the absence of oxygen. In contrast to landfill gas, biogas is produced through a (semi-)continuous process, very similar to the digestion process that takes place in a cow’s stomach. In addition, the anaerobic digestion process produces digestates that can be used for fertilising land without the greenhouse gas and other harmful environmental consequences of nitrogen-based fertilisers.

Traditionally, biogas has been converted to electricity at a biogas production facility on-site. However, the production of biogas as a general replacement of natural gas for industrial and home-use represents a potentially more efficient option.

Current UK biogas production supplies only a fraction of UK gas consumption and under the status quo production is set to decline. However, the scope for greater use of biogas is vast. It is increasingly common practice in Austria, Germany, Switzerland and Sweden for biogas (which is upgraded to bio-methane) to be injected into the gas grid for environmental and energy efficiency reasons. Schmack Biogas, the largest biogas company in Germany, now has a capacity around Munich of almost four million cubic metres of bio-methane per year. Indeed, it is predicted that the EU could use biogas to replace all imports from Russia by 2020; a 2007 report on the potential of biogas in Europe carried out by the Öko-Instituts and the Institut für Energetik concluded that Germany alone can produce more biogas by 2020 than all of the EU’s current natural gas imports from Russia.

National Grid forecasts that given the development of anaerobic digestion and thermal gasification plant infrastructure, biogas production has the potential to be a significant source of fuel for the UK and, ultimately, could meet nearly 50% of residential demand.

Industrial CHP

For many years, manufacturing industries have been aware of the potential for capturing the heat produced from electricity generation in order to use this for industrial processes. Where the manufacturing process involves both the heavy duty use of electricity and considerable demand for heat, on-site combined heat and power (CHP) generation can be an extremely efficient use of energy, raising total thermal efficiency from the 55 per cent associated with the most modern combined cycle gas turbines to as much as 80 per cent – thereby reducing reliance on hydrocarbons and, of course, also reducing the carbon emissions being generated.

Examples of successful industrial CHP schemes in the UK include: the expansion of ConocoPhillips’ Immingham (CHP) plant by 450 Megawatts (MW), from 730 MW to 1,180 MW\textsuperscript{35}.

Most recently, we have seen the development of Thor Cogeneration 1,020-MW gas-fired combined heat and power station in Teesside\textsuperscript{36}.

However, industrial CHP in the UK lags behind some of our competitors – notably the Netherlands and Denmark.

It has been estimated by Pöyry Energy Consulting that, if Britain were to catch up with the leaders in industrial CHP, we could generate as much as 14GW of electricity, with a total effect on carbon emissions of 26 million tonnes annually carbon dioxide equivalent per year for 4.6 of total UK emissions.

### District heating

In addition to domestic and industrial CHP, district heat capture offers another substantial opportunity to de-carbonise heat. District heating is well-suited to energy usage dense areas, such as inner cities, linking homes and offices to a district CHP centre through a heat pipeline network.

Examples of successful district energy schemes in the UK include Southampton and Birmingham, but the UK lags behind other countries, notably Denmark, in the development of low carbon heat networks. The potential for both carbon and fuel bill savings to households participating in a district energy scheme is as much as 5 tons per annum per dwelling and 10% per annum respectively\textsuperscript{37}.

### Energy efficiency technologies in industry

The oil shocks of the 1970s and the 1980s – and the knock-on economic repercussions – forced businesses to analyse their consumption and work towards conserving energy. By the 1990s, the effects were visible. Between 1990 and 2002, the fastest energy efficiency improvements could be seen in industry (12 per cent), followed by households (9 per cent) and transport (7 per cent). However, the growth of the service economy has counteracted some of the advances made in manufacturing. Energy demand in the service sector, where energy is typically a smaller proportion of the cost base than in manufacturing, has increased by 80 per cent since 1980.

Although many businesses have taken the lead on reducing consumption, there are still big savings to be made. According to the Carbon Trust, UK industry is wasting £7 million a day on poor energy efficiency. The Energy White Paper (2007) warned that up to 10 per cent of the energy that businesses buy is wasted through bad practice such as leaving appliances on, poor control of heating and excess use of air conditioning.

Companies which make strategic investments in energy efficiency have been rewarded with huge dividends. Two examples of best practice were cited by the Conservative Quality of Life Policy Group: DuPont, which saved $2 billion between 1990 and 2005 through increased energy efficiency, while reducing global consumption by 6 per cent and cutting emissions by 60 per cent; and BT, which in 2006 alone saved £400 million by reducing its energy consumption. According to the Carbon Trust, UK business could collectively save up to £2.5 billion in the next twelve months, simply by implementing cost-effective efficiency measures. This is comparable with the combined annual salaries of over 100,000 employees working on the average national wage.


\textsuperscript{36} Department for Business, Enterprise and Regulatory Reform, Government gives consent to construct a combined heat and power station at Seal sands, Teesside, press release, 28 August 2008.

\textsuperscript{37} Source: Institution of Civil Engineers, September 2008.
One example of fundamental savings that can be made in the industrial sector cited by the EEF is correcting inefficiencies in industrial motor systems.

There are over 11 million motor systems in UK industry, installed at a total capacity of 90GW. Their function ranges from powering pumps, fans, compressors and other machinery at the heart of modern manufacturing. They are often based on highly inefficient designs. Motor systems can account for almost two thirds of electricity consumption on an average industrial site – and an astonishing 40 per cent of national electricity consumption.

According to the EEF, there is considerable scope for increasing the efficiency of the motor systems, by including Variable Speed Drives (VSDs) into the system to ensure that the pace of the motor more precisely matches the level at which the device needs to be operated at any given moment. By applying VSD into the design, the energy consumption of the motor can be reduced by 60 per cent.

However, market penetration remains at a very low base due to technical complexity (the energy savings associated with VSDs can be widely variable given the context of their usage). The Carbon Trust and the industry are currently working on reaching acceptable criteria for packaging the VSD as part of the Carbon Trust’s ‘Energy Technology List’, which can then be marketed to companies.

**Smart metering in homes**

Smart meters are already in operation in Sweden, Italy, Australia, the USA and Canada. Italy has almost completed a programme to convert 30 million homes to smart meters; Sweden has plans to introduce 5.2 million by 2009; and 5 million homes in Ontario are to be provided with smart meters by 2010.

Comprehensive smart metering programmes have multiple advantages. They cover both electricity and gas (and can also cover water use), and they offer accurate real-time information on the amount of gas, electricity (and water) being used by any given household, allowing accurate billing.

At present, energy bills often contain estimated figures that make it difficult for consumers to make informed decisions to help reduce their costs and consumption. However, once people have installed micro-generation and smart meters, they are likely to become much more energy conscious. Either on the meter itself or via digital televisions or their mobile phones connected to the meter through the internet, electricity users become able to see their own patterns of use and patterns of electricity production. This can only help to make them more conscious of energy waste – since it enables users to see immediately the effects of any steps they take to make their homes more energy-efficient.

A review of studies of smart meter introduction suggests a potential to deliver sustained energy savings of 5 per cent to 10 per cent for many customers.38

The present Government had proposed, and pushed, a less advanced alternative known as a ‘clip-on’ meter or Electricity Display Devices (EDDs). Such devices do not include the ability to meter gas or water and do not connect to an outside network that can automatically provide accurate billing data. They offer no capability for micro-generation because they measure only electricity flowing into the premises and have no capacity to measure the output of electricity flowing out of the premises and have no capacity to measure the output of electricity from micro-generation installed in the premises.

The Government has now dropped the policy that, from 2008, any individual who wanted to obtain an EDD would be able over the subsequent two years to request one, free, from their electricity supplier. The Government now favours a ‘consultation’ on smart meters, despite apparent support from various

---

Ministers for free EDDs on demand. There is clearly a strong argument for far more vigorous action to promote the use of smart meters throughout the housing stock.

**Heat pumps**

Alongside smart metering in the home, and to complement the new technologies for micro-electricity generation in the home described in Section 4.1, there are considerable opportunities for generating domestic heat through the use of ground-source and air-source heat pumps. Ground source heat pumps are considered a proven technology in the UK. The basic idea is simple: they use a buried ground loop which transfers heat from the ground into a building to provide space heating and, in some cases, to pre-heat domestic hot water.

Heat pumps are acknowledged as a technology that uses renewable energy sources from air, water and shallow ground in the European Commission proposal for a new Directive on the promotion of the use of energy from renewable sources. However, at present, the UK – as in so many low carbon technologies – is lagging. Heat pumps are by now the most common heating system in single-family houses in Sweden (approx. 34 %). In contrast, the overall heat pump market in the UK is still small. The UK has experienced only modest sales, with almost no installed base in 1998 and only 546 installations in 2006, with an additional 357 installations funded by Stream 1 of the Low Carbon Buildings Programme.

**4.3 Transforming technologies in transport**

**Biofuels**

Road transport accounts for 54 per cent of petroleum products use and 22 per cent carbon emissions in the UK. Reducing emissions from transport has to be a key part of any effective strategy to shift to a low carbon economy. In this paper, we set out a number of ways to achieve this goal, including a role for biofuels.

A number of the so-called “first-generation” biofuels currently on the market have run into trouble regarding the sustainability of their production. In Section 6.3 below, we outline the steps we would propose to take to remedy these concerns.

Second-generation biofuels have the potential to yield significant benefits over their first-generation predecessors. They offer greater opportunities to utilise crops such as grasses and woody biomass grown on marginal land. They are produced from non-food, lignocellulosic biomass (formed from the woody cell walls of plants) that can be grown rapidly and in large quantities, requiring minimal fertilisation and water, thereby resulting in minimal soil erosion. In addition, some of their waste materials can be utilised.

The technology needed to produce second-generation biofuel relies on the release of monomers from the polymers within plants and is currently prohibitively expensive to carry out on a commercial scale. Although there still remains considerable uncertainty as to whether, and if so when, they will become viable at a commercial scale, projections by BP show that, within 10 years, the technology will have...
advanced to the point where overall costs will be reduced.\textsuperscript{45} Shell hopes to have a second-generation biofuel, which can be produced from plant waste rather than food crops, on the market in 2012, and believes that we are only five to 10 years away from substantial volumes of second-generation biofuels.

Developments in biofuels are currently focused on road transport but the prospect for developing biofuels for aviation is also improving at an impressive rate. The second-generation technology used for production of diesel from biomass could be developed to produce bio-kerosene, which would have similar properties to petroleum-derived kerosene but would deliver emission savings. Alternatively, there is some scope for blending small amounts of biofuels with aviation fuel.\textsuperscript{46} In addition, biofuels are an integral part of the emerging ‘bio-economy’, where plant material is used to produce specific chemicals and bulk industrial chemicals. In the future these may increasingly replace chemicals derived from fossil fuels.

**Electric cars**

Fluctuating oil prices and falling demand for higher-emission vehicles are accelerating a push by car-makers into next-generation electric and hybrid petrol-electric vehicles. Including road tax and fuel, electric vehicles cost on average 1p/mile, as opposed to the current Internal Combustion Engine costing on average between 8-16p/mile.

There is currently a technology battle between vehicle makers over two competing power sources: plug-in rechargeable batteries and fuel cells that generate electric power using hydrogen. Nissan plans to launch an electric car powered by a lithium-ion battery in Japan and the US in 2010. Mitsubishi is offering an electric car in 2009. In June 2008, Honda became the first car-maker to offer a hydrogen-powered car to customers - leasing its FCX Clarity to a small number of customers in California.

There are signs that the consensus may be heading towards batteries rather than fuel cells since the latter are at least a decade away from being a viable technology. Honda’s FCX Clarity currently costs £950,000 a vehicle to produce.

While it is not possible to predict long term technological changes, it seems clear that over the next 10 to 20 years, a shift to electric vehicles offers the best prospect for delivering low carbon motoring. This seems likely to occur through the progressive introduction of plug-in hybrids which enable petrol or diesel to be used for journeys beyond the capacity of the battery. Significant progress is being made towards getting highly fuel-efficient low carbon hybrid vehicles on to the market.

The development and introduction of electric (and in particular of plug-in hybrid) vehicles as a new norm offers the potential, in itself, for a transformation of Britain’s dependence on hydrocarbons. The 34 million vehicles, including 28,000,000 cars currently on Britain’s roads consume 26,542 (passengers) + 16,273 (freight) thousand tonnes of oil equivalent per year, with a total estimated cost of £12.7 billion per year and total current annual carbon emissions of 121.2 million tonnes. Moving to an all-electric fleet would therefore reduce UK carbon emissions by around 22 per cent, improve our balance of payments, and reduce our hydrocarbon dependence.

Accordingly, this is probably one of the most important of all the transforming technologies considered in this paper – and it is of the greatest possible importance that Britain should be in the vanguard.

Sadly, we are once again lagging. In California, Governor Schwarzenegger has introduced an Alternative Fuel Vehicle Incentive Program – offering up to $5,000 for the purchase or lease of alternative fuel vehicles. Battery electric vehicles, such as the Tesla, typically receive the full $5,000


\textsuperscript{46} National Non-Food Crop Centre, *Liquid Fuels*; http://www.nnfcc.co.uk/metadot/index.pl?id=2191;isa=Category;op=Show#2580
grant- and a federal tax deduction of up to $100,000 per location for qualified electric vehicle recharging property used in a trade or business.

Meanwhile, in Israel, an agreement in January 2008 between the Renault-Nissan Alliance and Project Better Place brought together the conditions necessary for electric vehicles to be mass-market:

- The Israeli government will provide tax incentives to customers, Renault will supply the electric vehicles, and Project Better Place will construct and operate an Electric Recharge Grid across the entire country. Electric vehicles will be available to customers in 2011.
- The Electric Recharge Grid infrastructure will be a massive network of battery charging spots. Driving range will no longer be an obstacle, because customers will be able to plug their cars into charging units in any of the 500,000 charging spots in Israel. An on-board computer systems will indicate to the driver the remaining power supply and the nearest charging spot.

In Portugal, the government has signed a deal with car maker Renault-Nissan to boost the use of electric cars by creating a national recharging network. The plan aims to make Portugal one of the first countries to offer consumers the possibility of nationwide charging stations.

In Denmark, the government announced they will establish an electric car network with about 20,000 recharging stations powered by the wind. DONG Energy of Denmark and Project Better Place will work together to build the US$42.3 million project for a start date in 2011.

Recently, Mr Brown announced that the Government plans to “kick-start a green car revolution” and make Britain “the European capital for electric cars”. However, there is little sign of any immediate, effective action to make this promise a reality.

By contrast, the new Mayor of London has set up the Electric Vehicle Partnership for London to support electric-car drivers in the capital and install more public points at which electric-car owners may top up their batteries. The Mayor has announced that he will almost treble the number of charging locations across the city and encourage London’s Boroughs to reduce parking charges for electric cars.

Urgent action is required to enable a mass-market in electric vehicles to grow in Britain.

**High speed rail**

Even if electric cars become the norm relatively rapidly, the twin factors of congestion on UK roads and the growth in hydrocarbon-based air travel both provide strong arguments in favour of the development of a high speed rail network in this country, to provide a viable alternative to both car and air journeys. Another strong argument for high speed rail is the prospect of shrinking the distance between North and South which could help bring the Midlands and the North of England within the London and South East economic zone. A high speed rail link extending as far as Edinburgh and Glasgow would also significantly enhance economic links between England and Scotland.

High speed rail is, of course, widespread on the Continent: France and Germany have 1,550km (963 miles) and 878km (545 miles) of high speed rail respectively in stark contrast to the UK’s 109km (68) miles between London St. Pancras and the Channel Tunnel. Significantly wherever the European network has expanded domestic air traffic has fallen or air routes have ceased completely. According to Railteam, the alliance of European high speed rail operators, by 2020 there will be 15,358km of high speed rail in Europe and the UK will lag behind countries such as Poland, Italy and Portugal with just 0.007% of the high speed network in Europe.

The advent of the Channel Tunnel and, now, of the high speed Channel Tunnel rail link has brought London to within two and a half hours of Paris by rail, and has also created the opportunity to connect the UK to the European high speed network – opening up the prospect of significant reductions, not only in the demand for domestic aviation, but also in the need for flights from UK cities to Paris, Brussels and other near European destinations.
TGV-style high speed rail technology (used on the Channel Tunnel rail link and in current Continental systems) is well established. By contrast, the maglev alternative (involving the use of magnetic levitation to enable frictionless trains to run above the track) involves much greater technology risks and more difficult challenges in terms of interacting with the existing rail network. However, maglev technology has potential advantages over conventional high speed rail in terms of its speed.

Whichever technology we choose, it is clear that any thoroughgoing approach to reducing Britain’s dependence on hydrocarbons (whilst at the same time preserving the competitiveness of our transport systems) must recognise the importance of high speed rail. Britain cannot be left behind: we need a high speed rail network in this country.
5. New networks: transforming the physical infrastructure

Our vision is for Government to take the lead in transforming the energy infrastructure in Britain, so we both make it possible to achieve a low-carbon economy and also transform the attractiveness of the UK for energy investors. When one considers the urgent need for Britain to reduce its dependence on hydrocarbons – and when one surveys the large and impressive array of differing technologies that are available to reduce the use of fossil fuels – the question inevitably arises: why is Britain still 90 per cent dependent on hydrocarbons for its energy?

A great part of the answer to this question lies in the fact that new technologies frequently require access to networks of varying kinds in order to enable them to operate effectively and economically – and such access has, in many cases, not been made sufficiently available. This is a deficiency that the market cannot be expected to cure without intervention since such networks are not typically (in the words of Adam Smith, quoted in Section 3.2) ‘of such a nature, that the profit could...repay the expense to any individual, or small number of individuals’. Without ready access to the relevant networks, private investors will not make the substantial investments required to take the new technology forward.

5.1 New networks in electricity

New carbon dioxide networks for carbon capture and storage

Carbon capture and storage (CCS) is a classic example of a technology which cannot flourish without the provision of a physical network – in this case, a network of pipes enabling the carbon that is captured at the power station to be transported to the depleted gas field into which it can be injected. When a new coal-fires power station is constructed, it will automatically (and almost invisibly) benefit from the shipping, road and rail networks which enable the coal to be brought to it. It will also benefit from the existence of the electricity grid, which will carry the power away from it. If each new coal station had to pay for the cost of establishing all these networks, the station would of course be uneconomic.

In the same way, we need to ensure that the first CCS plants do not have to bear the cost of establishing the carbon disposal networks which are required for the sake of the country as a whole rather than merely for the sake of that particular plant.

We therefore propose to use receipts from the auctioning of EU Emissions Trading Scheme (ETS) permits to fund carbon pipelines to the North Sea for each of at least three large coal-fires power stations with a total capacity of the order of 5,000MW. This will work alongside the new market signals for CCS described in Section 6.1. Together, the provision of the new infrastructure and new market signals will enable the UK to establish the core of new carbon deposit networks, which can thereafter be progressively developed and expanded.

In order to ensure that the initial pipelines do indeed constitute the basis for progressively established physical carbon disposal networks, we will ensure both that the original pipes are over-sized, and that open access to the pipelines is secured (either through government ownership or through contractual rules on third-party access). In this way, the pipes will be available for other companies to use as the amount of CCS progressively increases – with new plants ‘plugging-in’ to the initial pipelines, reducing the costs progressively as the networks evolve. To assist further in the evolution of such networks, we intend – as part of the development of the initial three projects – to establish a regulatory framework for the long-term governance and pricing of access to the carbon dispersal network.
New networks for marine power

The slow pace of investment in new technology to exploit our enormous wave and tidal resources, presents another classic example of the need for network provision.

The Government has established a Marine Renewables Deployment Fund of £50 million. But the Fund remains unspent – partly due to the fact that there is not sufficient, readily available infrastructure which can be exploited by those seeking to research and develop emerging marine technologies in different locations. Instead of a range of easily available offshore sites, suitably connected to onshore infrastructure, industry complains of bureaucratic obstacles, delays in obtaining sub-sea leases from the Crown Estate, difficulties in securing grid connections for small generators, and lack of the onshore infrastructure required to make access to an offshore site easy.

It is for engineers and entrepreneurs themselves to undertake the design and development of the technology: this is not something that government can do efficiently, or should try to do. But, as in the case of the new carbon disposal networks, it is very much a role for government to overcome the obstacles that are presently inhibiting the proliferation of such marine experimentation and to ensure that an infrastructure is provided which sustains such development.

There are analogies, here, with science parks and bio-incubators, and with urban regeneration and development. As with the science parks and bio-incubators, we need to ensure that there is adequate connection to existing, relevant networks – in this case, principally, easy and open access to the national grid for small marine generators. And, as in the case of urban regeneration and development, we need to ensure that the bureaucratic obstacles, such as obtaining sub-sea leases and constructing suitable onshore infrastructure for ease of access, are overcome by a body which is adept at dealing with other bureaucracies, and which can offer the experimentalist and the entrepreneur a one-stop-shop to deliver ready access to the needed items.

We accordingly propose to use the £50 million in the Marine Renewables Deployment Fund to back a vehicle to establish a network of large scale Marine Energy Parks – run on a commercial basis by a company after tender. Suitable coastal sites will be identified by feasibility study and with regard to government conservation duties under the Marine and Coastal Access Bill.

The new Marine Energy Parks (drawing on the precedent of the European Marine Energy Centre) will provide:

- streamlined planning for new projects and sub-sea leasing;
- provision of dedicated grid connection;
- port/ hard standing onshore for service; and
- other infrastructure links,

With the aim of:

- generating centres of excellence in marine technologies;
- facilitating development from small-scale university trials through to full-scale commercial projects;
- regenerating coastal areas, bringing jobs and infrastructure; and
- working hand in hand with local communities and fisheries to promote a carefully balanced environmental approach.

New networks for offshore wind power

Although offshore wind power is both a significantly more mature technology than wave and tidal power, and one that is being already being deployed on a commercial scale in UK waters, this renewable power source still suffers from lack of network infrastructure. As with carbon capture and marine technologies, the economics of new offshore wind plants are substantially affected by the need
to construct elaborate and expensive connections to existing networks, causing both delay and reduced profitability.

After a long period of inactivity, the present Government has now begun to clear the way through some of the regulatory thickets that were impeding progress – most notably, objections to offshore wind power from the Ministry of Defence based on interference with radar systems. However, no serious steps have yet been taken to provide ready and affordable access to the national grid, without which the prospects for achieving anything like the Government’s intended total of 33GW of offshore wind power by 2020 are dim.

In addition, the present Government appears wholly to have failed to tackle what is, from an engineering and economic point of view, a fundamental issue in relation to large quantities of offshore wind – namely, the variability of the product. Because wind speeds are not consistent, the production of electricity from offshore wind cannot be ensured at any precise time, and may consequently fail to match the pattern of demand from domestic and industrial consumers (the so-called load curve). Manifestly, if this variability of production were to require large amounts of back-up from power stations with more predictable output this would, at the least, expose the electricity customer to significant additional cost and would, at the worst, cause additional hydrocarbon dependence if fossil fuel stations were used for back-up.

Both of these inhibitors – the lack of cheap and easy access to the electricity grid, and the problems associated with variability of production from offshore wind power – can be tackled through the development of new network architecture.

So far as the question of easy and open access to the grid is concerned, the solution lies in the creation of new physical infrastructure. We will accordingly alter the regulatory regime under which National Grid operates – in consultation with Ofgem – in such a way as to ensure that National Grid constructs readily accessible under-sea Direct Current (DC) cables on the East and West coasts and offers connections to these. At current investment levels, according to National Grid the cost of installing such cables would be around 10 per cent of their capital investment programme.47

![Figure 5.1. Proposed under-sea Direct Current (DC) cables on the East and West coasts](source: National Grid, January 2009)

Meanwhile, we need to reduce the requirement for large amounts of ‘back-up’ capacity from fossil-fuel power stations. We will therefore also mandate National Grid to develop and operate a ‘smart grid’. Such a grid would make use of intelligent technology to allow customers to save money by using low cost tariffs for electricity used at times when demands on the grid are lowest and supply is most abundant.

47 Source: As advised by National Grid Company, January 2009.
Load management has, of course, been a consistent feature of the electricity supply industry for decades. Many large-scale industrial consumers of electricity frequently have such contracts. But the potential for far greater degrees of load management in industry and agriculture, in commercial and public sector offices and in homes can now be exploited through the combination of broadband networks and smart meters at customer premises, which have the capacity to align more closely by appliances when electricity is at its cheapest and most abundant.

There is, in addition, a happy coincidence between what is required for the operation of a smart grid that can accommodate large amounts of offshore wind power, and what is required for the encouragement of large amounts of decentralised energy of the sort described in Section 4.1. In both cases, the architecture is fundamentally dependent on the near-universal installation of smart meters.

We therefore propose to legislate for the roll-out of smart meters to all gas, electricity and water consumers over a ten-year period. The installation of such smart meters could be undertaken by the District Network Operators who own local distribution networks, as proposed in the Conservative Quality of Life Policy Group report, *Blueprint for a Green Economy*, and in our previous green paper *Power to the People*. But we are also continuing to consult on two other options involving either a responsibility for suppliers to install smart meters for their own customers or a regional tender-based system under which suppliers would tender for the contract to install all the smart meters in a given geographical area.

We will also work with the National Grid to examine the development of electricity storage facilities, either onshore or offshore, using hydrogen or compressed air, to balance the electricity generated by offshore wind turbines and to provide a more constant and predictable flow of electricity to the Grid.

Finally, we will consult with National Grid and other interested parties, to determine the feasibility of constructing further international DC cables, linking the UK electricity grid with Scandinavia, in such a way as to enable the UK to draw on offshore wind power constructed in Scandinavian waters. This may, in turn, contribute in due course to the development of a ‘super-grid’ which could ultimate cover the Baltic Sea, the North Sea, the Irish Sea, the English Channel and the Bay of Biscay – offering the potential for wind power drawn from a wide geographic area that encompasses different weather systems and can consequently create increased reliability and predictability of power supply, thereby complementing the advantages of a UK ‘smart grid’ approach.

**New storage for nuclear waste**

The provision of national infrastructure is as important for the viability and acceptability of replacement nuclear plants as it is for the feasibility of CCS, marine power and offshore wind power. As we set out in Section 4.1, the identification of a national waste site and the establishment of a guaranteed regime for handling nuclear waste are crucial elements of that infrastructure.

The Committee on Radioactive Waste Management recommended in 2006 that geological disposal of nuclear waste, coupled with safe and secure interim storage, was the best way forward. This conclusion was accepted in the Government’s White Paper, *Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal*, on 12 June 2008, which rightly stated that safety must be the paramount consideration in the selection of the site.

The White Paper was coupled with an invitation to communities to open up discussions with government – without commitment – on the possibility of hosting a facility at some point in the future. We note that in other countries it has been possible to identify geological disposal sites in this way.

We have called on the Government to provide an assurance that companies producing new waste will be responsible for their share of the benefits – including revenue from business rates - which may be paid to a community which is assessed as suitable. This is consistent with the principle that there should be no taxpayer subsidy for new nuclear-build. We welcome the establishment of the new Nuclear Liabilities Financing Assurance Board (NLFAB) to ensure that the operators of any new...
nuclear power stations, rather than taxpayers, finance the costs of decommissioning and waste disposal management; and will scrutinise its activities closely.\footnote{Department of Energy and Climate Change Press Notice. New Nuclear Funding Watchdog Appointed. 3 November 2008.}

**New networks for return and collection of low energy light-bulbs**

At the opposite end of the spectrum from nuclear power, with its large and ‘lumpy’ investments, lies the question of low energy light-bulbs. But, as noted in Section 4.1, the need for provision of a suitable national infrastructure is as acute in the case of the current generation of low energy light-bulbs as in the case of nuclear waste. Until and unless a new generation of LED bulbs comes to replace the existing mercury-based bulbs, we will continue to face the need for a national collection and disposal network that will enable users to dispose safely of the existing low energy bulbs in accordance with the WEEE Directive.

We accordingly propose to increase the number of designated collection facilities for low energy light bulbs (currently 1,556 mostly located at civic amenity sites, commonly known as ‘tips’), by working with major retailers to follow the example of The Home Depot who have voluntarily launched in the US a national low energy light bulb recycling program at all its 1,973 locations.

**5.2 New networks in gas and heat**

**Open access to gas networks for biogas**

Nowhere in the energy system is a change in network architecture more necessary than in relation to biogas. As described in Section 4.2, the potential for biogas produced by anaerobic digestion to contribute to reducing UK dependence on fossil fuels is enormous. But, in order to realise this potential, it must become possible for the biogas produced by the anaerobic digestors and gasifiers to be fed into the gas grid.

This can be achieved only if there is recognition of the principle of equivalence for bio-methane. Equivalence is already a well-established principle in relation to renewable electricity. For example, power can be fed into the grid from a Welsh wind farm, and the equivalent amount of renewable electricity consumed under contract by a customer elsewhere. The customer is still regarded as consuming renewable electricity. Similarly, it should be possible to obtain credit under any environmental scheme by feeding-in a certain amount of bio-methane to the grid at one location, and extracting the same amount of gas elsewhere to provide heat, power or transport fuel.

There are no insurmountable technical barriers to putting bio-methane into the UK grid; biogas can be safely cleaned (removing the carbon dioxide, hydrogen sulphide and water contents) to become methane; and transport can be via the existing gas distribution and transmission infrastructure with no need for additional investment other than in gas quality monitoring equipment and the connecting pipe work. If bio-methane goes directly into the grid, it saves more carbon dioxide than if it is used to make electricity on the farm or at the waste disposal site where the biogas is produced.

We will ensure that the appropriate regulatory regime is implemented to enable the gas network companies to accept large quantities of biomethane into the gas grid, with an open access regime that minimises bureaucracy and provides automatic certification of the renewable nature of the gas so that it can qualify for support through a biogas feed–in tariff. We describe, in Section 6.2 below, the new market signals for biogas to match this change in network access.

We are conscious, also, of the need to ensure that anaerobic digesters established in agricultural areas, which are some distance away from the nearest gas mains network, will have access to the mains. In some cases, this may also represent an opportunity to provide access to gas for rural customers who are
currently off-grid and dependent on oil or electricity for central heating, with considerable consequences for fuel poverty and carbon emissions.

**New district heating networks**

District heating is yet another of the technologies for decreasing hydrocarbon dependence which requires new network architecture.

Several recent reports\(^49\) have identified carbon emissions from heat as a key target for UK emissions reduction. 400 TWh of gas is used in the domestic and services sectors\(^50\) – assuming that some 10 per cent is used for cooking, 360 TWh is for space heating and domestic hot water which amounts to some 69 million tonnes of carbon dioxide.

However, district heating is not likely to be introduced where new developments (either very recently built or built after the construction of the district network) opt out of a district system and then sit as a physical block to the effective commercial expansion of the scheme. A classic example of this is Brindley Place in Birmingham which was built shortly before the development of the Broad Street district energy scheme in the centre of Birmingham, and is immediately adjacent to the energy centre (the building that generates the energy) for the new Birmingham Scheme. Each building on Brindley Place, which is a high density urban development, has its own boiler with no low carbon generation. In this relatively modest instance it is estimated that, with no diseconomy, 22 per cent of emissions could have been saved if Brindley Place were integrated into the scheme.\(^51\)

![Figure 5.2: Photo-map of Birmingham District Heating Scheme](image)

---


\(^51\) Source: Utilicom, 2008.
Denmark has very successfully solved this sort of problem and has enabled commercial operations to deploy widespread CHP through zoning and infrastructure intervention\(^{52}\). In line with our localist agenda, we propose that in England, local councils should be given the power to zone urban areas by energy usage density (a relatively simple and cheap action) and to distinguish those areas which would be suitable for district energy schemes from those where individual building heat generation, due to the lower energy density, would be appropriate. Local councils will also be given statutory authority to provide infrastructure grant funds, for example, to link pockets of high energy usage with heat ‘mains’ and to use suitable road work opportunities, such as broadband rollout, to install heat pipes.

Councill will, under the legislation, be given the power to require new developments in high energy density zones to use district heat unless they can show that it would be cheaper for them to do otherwise. This will apply to existing buildings in the CHP zones at reasonable intervention points such as the replacement of boilers.

Public buildings with boilers will also be able to feed into integrated district heating schemes, (demand curves for schools and homes are typically complementary) and be able to shorten their payback periods on new technology by selling this spare heat.

### 5.3 New networks in transport

**New distribution networks to support electric vehicles**

An important means of achieving the goal of greening the fleet of cars on the UK’s roads is to set long term targets for the car industry on emissions, sending a clear signal but leaving the industry experts with maximum flexibility on how to deliver the goals we have set them. In April 2006, we set a target of reducing the average level of emissions for new cars to 100g/km by 2022. By 2030, we want to see that figure as an average for all cars on the UK’s roads. In the European Parliament, we have supported even tougher emissions targets including demanding interim milestones to be achieved by 2012 and 2015. Throughout the debate on the EU’s new law on greener cars, we pressed for a common sense outcome to achieve the strictest emissions rules in the world but without imposing such significant burdens on the car industry as to jeopardise the investment needed to deliver the technology to make cars greener.

Amongst the most important and exciting technological developments identified in Section 4 of this green paper, is the move towards electric vehicles as the norm. Given the important part electric cars look set to play in reducing emissions from driving, we need to do more to encourage uptake of these vehicles. As outlined in Section 4.3, there is no realistic prospect of developing a mass-market for electric vehicles in the UK unless and until there is a national network of recharging points enabling drivers to operate electric vehicles across any chosen distance without fear of running out of energy (sourced eventually from decarbonised electricity).

Our aim is that the network of charging stations keeps ahead of electric vehicle technology. We want the UK to be a place of choice for motor manufacturers to trial electric and plug-in hybrid vehicles. Using Mayor Boris Johnson’s London electric vehicles pilot project as a starting point, we intend that the UK should develop a new national recharging network enabling Britain to lead the world towards replacement of traditional cars by electric and plug-in hybrid vehicles.

To incentivise the deployment of public charging points we propose to designate them – in consultation with Ofgem – as regulated assets, adding them to the existing regulated assets base of the Distribution Network Operators (DNOs). Designating charging points as regulated assets will enable DNOs to invest ahead of need and cover the installation costs. We recognise that the electricity

networks (particularly DNOs) will require additional reinforcements over and above the cost of new charging posts. These costs will be subject to recovery under the normal regulatory process managed by Ofgem. Finally, standardisation of charging posts will be important so that all types of plug-in vehicles can make use of the network.

In the long term, mass adoption of electric vehicles could significantly increase demand for electricity (estimated at around a 16% (approx 64 TWh) increase if all 26 million of the UK’s passenger cars were electrically powered)\textsuperscript{53}. According to National Grid and the Government’s own feasibility study, there is sufficient generating capacity to cope with the mass switch to electric vehicles and Plug-in Hybrid Electric Vehicles (PHEVs) because the demand for electricity will occur mainly at times when demand from other sources is low\textsuperscript{54}. To cope with the load, demand for charging will be managed through electricity tariffs targeted at off-peak periods, and through vehicle-to-grid ‘V2G’ technology or ‘smart charging’ technology.

Current US-Swedish Joint PHEV Research is developing instrumentation for PHEV and vehicle-to-grid hardware so that users will be informed by the grid operator of real-time pricing and availability – giving users the ability to programme rechargers at times when demand for electricity is low. Similarly, smart charging allows the vehicle to maximize the charge rate when a surplus of load is available, and to minimize the charge rate when it is not; the smart charging points will inform the user, provide an opportunity for user input to the recharge process, and manage the billing automatically\textsuperscript{55}. Such 'dynamic demand management' will play a role in addressing the intermittent nature of some renewable technologies.

With this vision in mind, we will ensure that in the UK there is joined up thinking across government and industry so that we agree common standards and make best use of our emerging ‘smart meter’ infrastructure. For example, smart metering will help suppliers target the best possible tariffs to a consumer with an electric vehicle and be capable of ‘following the consumer’ no matter where he or she decides to charge. The same backbone infrastructure can be ‘built on’ to turn off and on the charging of electric vehicles – and indeed other appliances in the home. This will support the economic and efficient operation of the electricity infrastructure, against a low carbon generation background to the benefit of all consumers.

**A new high speed rail network**

The case for a new high speed rail network for the UK is gathering increasing momentum. Reasons to support such a project include:

- the looming capacity crunch on the railways;
- congested roads;
- increasing reliance on domestic flights; and
- the importance of sharing the economic growth of the South East with the Midlands and the North.

A future national network strengthens the Union and the case for ‘UK plc’ as an attractive location for Foreign Direct Investment (FDI).

It is time for UK high speed-trains to become as emblematic as Japan’s bullet trains. Analysis based on costings produced by engineering consultants, W.S. Atkins, suggests that, at the same ticket prices as

\textsuperscript{53} Department for Business, Enterprise and Regulatory Reform, *Renewable Energy Strategy Consultation 2008*

\textsuperscript{54} Argonne National Laboratory Transportation Technology R&D Center, US-Sweden Joint PHEV Research, October 2008.

for existing standard speed services, high speed train operators could make healthy returns (and pay a franchise fee) if the up-front cost of track and land is met by Government.

As announced by Theresa Villiers in September 2008, we will open a competition for the next phase of high speed rail – a link between London, Birmingham, Manchester and Leeds - immediately on taking office.

We will target construction to start by 2015 and to complete the next phase by 2027. We will offer a fixed payment towards land and track, leaving the private sector to cover the remainder of the costs together with construction and operating risks. We will introduce a hybrid Bill in Parliament to resolve the planning issues as efficiently as possible. We will seek competitive bids to construct the line and will require competitors to guarantee journey times.

We also back a scheme along the lines put forward by the engineering firm, Arup, to build a new rail hub at Heathrow, linking the airport terminals directly to the main rail line out to the west as well as to a new high speed rail connection to the Channel Tunnel Rail Link and to the new North-South network.

In parallel, we will cancel all moves towards a third runway at Heathrow. BAA figures for 2007 indicate that there were 63,200 flights between Heathrow and Manchester, Leeds, Paris, Brussels, Amsterdam and Rotterdam - all destinations where it is realistic to expect high speed rail to replace flying. Freeing up this many landing slots at Heathrow would provide around 30% of the capacity of a third runway. This proportion could rise dramatically in the future with a more extensive high speed network in the UK and improved connections in Europe.

The new line to the North of England will be just the start of a network that will in the future stretch across the nation, including a full north-south line connecting Scotland as well as the North East and the North West of England with the Midlands and London.
6. New market signals: transforming the financial incentives

The provision of new networks (and the provision of improved access to existing networks) in carbon disposal, electricity supply, gas, heat and transport will go a long way towards enabling Britain to take an international lead in developing the emerging technologies that can permanently and massively reduce our dependence on hydrocarbons.

But, as we point out in Section 3 of this green paper, the provision of new networks and better access to networks is not enough. To achieve the transformation to a low carbon economy, government also needs to establish the right framework of incentives – to send the right signals to the marketplace.

One of these signals is, of course, the pricing of carbon itself. This is fundamental to the achievement of a low carbon economy. Businesses and consumers alike need to see the wider economic and environmental costs imposed by carbon translated into immediate price signals that make fossil fuel-intensive forms of energy relatively more expensive; and low carbon forms of energy relatively less expensive: (in the jargon, the externalities need to be internalised).

The European Emissions Trading Scheme (EU ETS) provides the framework for the pricing of carbon across the economy. This scheme involves setting maximum emission limits for given sectors of the economy within each EU country; these limits are translated into permits allocated to specific businesses by national governments; and the permits can then be traded between businesses across Europe in cases where one business uses more hydrocarbon than its permits would allow whereas another business uses less than its permits would allow – thereby creating a financial incentive for all businesses to use less than the permitted quantities of hydrocarbon. To make this scheme work properly, the initial allocation of permits needs to be on the basis of an auction in which a carbon price is established by firms bidding to obtain permits. And the scope of the EU ETS also needs to be enlarged so that it progressively covers more and more economic activity – starting with an extension to include air travel – as has already been agreed for flights within the EU from 2012.

So far as mature technologies are concerned (e.g. nuclear and gas technologies), the combination of proper access to networks and the proper pricing of carbon through the auctioning and trading of carbon permits should provide all that the market requires to ensure rational investment in low carbon solutions that progressively liberate us from dependence on imported hydrocarbons. But, when it comes to emerging technologies, the position is different. Businesses may not invest in these technologies unless the additional risk, compared to investment in mature, higher carbon technologies is compensated through market intervention in the form either of regulation compelling all competitors to opt for low carbon solutions or in the form of special financial incentives.

Accordingly, in this section of the green paper, we set out the steps that a Conservative government will take to establish pro-low carbon regulation in some areas and to provide special financial incentives for emerging low carbon technologies, funded out of the receipts from the auctioning of the UK’s EU ETS permits.

6.1 New market signals in the electricity supply industry

New market signals for carbon capture and storage

Carbon capture and storage (CCS) is one of the emerging technologies which very clearly requires both forms of market intervention if it is to reach the point where its viability at scale is clearly established.

We believe that, instead of holding a restricted competition for a single CCS demonstration project, the Government should use the anticipated investment in new coal stations to kick-start a low carbon energy revolution in the UK.
Governor Schwarzenegger has shown the way. The California Greenhouse Gas Emissions Performance Standard (EPS), which became law in 2007, requires all new base load generation serving the California market to have emissions no greater than a modern Combined Cycle Gas Turbine plant – 500kg of CO₂ per MWh.

Governor Schwarzenegger has described the EPS as being similar to the standards set for appliances such as fridges, “where there are minimum performance standards and beyond that it is up to the market to compete, as long as they meet or exceed this minimum standard”.  

As David Cameron announced in June 2008, a Conservative government, following Governor Schwarzenegger’s lead and the Science and Technology Select Committee’s recommendation, would replace the current Government’s plans for a single-plant CCS competition and instead:

- fund a variety of large-scale CCS demonstration projects of varying types of technology, including both pre- and post-combustion carbon capture over the next five to 10 years, out of receipts from the third and subsequent phases of EU Emissions Trading Scheme (ETS). This should enable large coal-fires power stations with a total capacity of the order of 5,000MW to be constructed or converted now and 2020 and to operate in accordance with an Emissions Performance Standard that required carbon emissions to be no higher than those from a modern gas power plant;
- if the industry brings forward further coal-fires plans in addition to the 5,000MW of government-sponsored pilots, we would make it clear that from the outset they must be developed to incorporate CCS technology on a scale that is capable of limiting carbon emissions to the level achieved by a modern gas power plant, and must be appropriately located, and government would fund sufficient CCS equipment to make that possible.

This combination of new regulation and new financial incentive will revolutionise the medium-term prospects for the development of full-scale CCS technology in Britain:

- rather than waiting for the ETS to deliver CCS development, a gas-equivalent carbon Emissions Performance Standard will send a clear market signal to UK power developers that their product must be at least as clean as the current highest efficiency gas power plant;
- the power developer can then choose between a number of options, including CCGT⁵⁷, IGCC⁵⁸, renewables or coal with CCS;

We envisage that:

- as with the Government’s competition, a schedule for achieving the required scale of CCS for each plant would be included in a contract with the government;
- under each contract, the operator would be compensated for the costs associated with the carbon capture equipment and the costs associated with the reduced output as a result of CCS (as well as the costs of the carbon pipelines to the North Sea - see Section 5.1), out of ETS receipts⁵⁹;
- the contracts would provide for a range of CCS technologies to be installed on different turbines;
- the addition of CCS to the plants would proceed on an open book basis, with open tenders for all capital equipment, so that the Government could ensure value for money for both parties;

⁵⁷ CCGT (Combined Cycle Gas Turbine) is a highly efficient electricity generator which combines a series of turbines to utilise a greater proportion of otherwise wasted energy.
⁵⁸ IGCC (Integrated Gasification Combined Cycle) is a CCGT power plant with a coal or oil gasifier attached.
⁵⁹ Projected auction revenues from the EU ETS by 2020, according to the Committee on Climate Change, are in the order of £3.8 billion per year; Committee on Climate Change, *Building a low-carbon economy – the UK’s contribution to tackling climate change*, December 2008, box 11.3, page 389.
• the intellectual property rights associated with the items such as the integration of the CCS chain and integration of the capture plant with the power station would be retained by the Government; and
• arrangements would be made to ensure that the Government retains rights over any storage assets for which it has paid.

In the longer term, helping companies to incorporate CCS into the next generation of coal-fired power stations will have a number of major benefits not just for the UK but for the state of the technology worldwide:

• the UK will be seen as a test-bed, identifying whether CCS can operate on such a scale, addressing problems that arise in the structural design (including issues of transportation and storage), and gaining a much clearer insight into the economics of the technology;
• intellectual property will be retained in the UK and will be exportable worldwide. UK companies will be able to participate in major foreign CCS markets, based on the experience of a series of commercial scale demonstration projects at home;
• with three workable demonstration projects in place, the UK will have the beginnings of a CCS pipeline system. If CCS is proven to be economically and technologically viable, other companies wishing to build further plants will be able to ‘plug-in’ to the existing network; and
• the creation of a CCS industry in the UK will offer the long-term prospect of creating new green jobs and help expand our skills base.

The ambition and impact of our proposals will go well beyond the transformation of coal-fired power generation alone.

We would expect future governments to ensure (either through the economic incentives of the carbon market or through direct regulatory intervention) that all fossil fuel energy production achieves much lower levels of carbon output consistent with progressive reduction of carbon emissions across the economy that is mandated by the Climate Change Act.

Part of the point of developing large-scale carbon capture and storage demonstrations is, of course, to make the achievement of such further reductions feasible by taking the technology to maturity. This will enable the operators of all fossil fuel plants to meet more stringent future standards (potentially similar to the degressive standards envisaged by the Lieberman Warner ‘Climate Security Act’ in the US) through fitting or retro-fitting whatever proves to be the appropriate and most effective CCS technology to the entire output of their stations.

New market signals for marine power and offshore wind power

Given that the UK possesses a coastline with the best wind, wave and tidal assets in Europe, it is clearly right that we should go beyond the provision of new network access for these technologies (through Marine Energy Parks and under-sea DC cables) and introduce, in addition, clear market signals that favour the development of these emerging technologies.

At present, these forms of energy, like other large-scale forms of renewable energy, benefit from the system of Renewables Obligation Certificates (ROCs). Under this system, electricity suppliers must collect certificates from the operators of renewable energy power plants, demonstrating the amount renewable electricity that they have bought. These certificates have a value in the marketplace because the electricity suppliers must present the certificates to the regulator.

60 ‘The Lieberman Warner Climate Security Act’, was the first comprehensive climate change bill to make it through a US Senate Committee (December 2007). The bill proposes applying an emissions performance standard of tapering intensity to US power stations over a long term time frame, in order for these power plants to qualify for additional tradable emissions certificates.
However, the system of ROCs has suffered from a major defect. Because the electricity suppliers can fulfil their obligations by obtaining their certificates from any form of renewable electricity producer, they naturally gravitate towards purchasing certificates from those who are willing to provide them most cheaply – and the cheapest providers of certificates have turned out to be, unsurprisingly, the operators of the onshore wind power which, being a relatively mature technology, is cheaper to install than most other forms of renewable energy.

The result – as revealed in Select Committee reports and as now acknowledged by the Government – has been an uncovenanted bonus for the onshore wind generators, some of whom have made spectacular returns, and a corresponding failure of the scheme to support the emerging technologies that are most in need of financial assistance. To address this major defect in the ROCs scheme the Government is now proposing to introduce a system of ‘banded ROCs’, under which emerging and immature technologies would earn more certificates per MWh of electricity production than more mature technologies which are less in need of support. The Government has completed its consultation on this proposal, with DECC aiming for the changes to be implemented on 1 April 2009 subject to Parliamentary time and approval, and receipt of EU State Aids clearance, which should ensure that the ROCs scheme comes much closer to securing its original purpose – namely, providing a compensation for the additional risks associated with emerging low carbon technologies. Therefore we are minded to adopt the system of banded ROCs as the means of delivering appropriate market signals for large-scale emerging renewable technologies.

New market signals for decentralised electricity generation

The introduction of banded ROCs is not, however, an appropriate method of encouraging the small-scale, decentralised, low carbon technologies that we also need to promote if we are to take full advantage of the opportunities now available to turn Britain into a low carbon economy. The system of ROCs is too cumbersome to be attractive to families, schools, small businesses and community organisations. What is required in order to promote the adoption of such small-scale low carbon technologies is a much simpler form of market signal.

Our separate green paper, Power to the People, published in December 2007, set out clearly the first steps an incoming Conservative government will take to bring about a revolution in decentralised energy. We want to dramatically change the UK electricity sector by enabling every household in the country to generate electricity. This means generating, at the point of use, part, and in some cases all, of the electricity needed.

Other European countries have shown what can be done. In Germany, there has been a micro-generation revolution over the last decade, based primarily on photovoltaic technology. In the Netherlands, CHP generation has led the way to a decentralised system.

By contrast, the British micro-generation industry is tiny. In 2005, the Energy Saving Trust estimated total annual turnover for the sector as £10-£20 million, employing between 200 and 600 people (excluding micro and fuel cell CHP). Market transformation will come only from the creation of genuine mass provision of micro-generation and the economies of scale that such a step-change will make.

We want to create a new retailing culture in which anyone can walk into a supermarket or show-room and buy a micro-generator in the same way that people now buy white goods and mobile phones. We also want to enable innovative energy service companies to provide customers with a ‘one-stop shop’ service that sells them the micro-generator, installs and finances it, gives full support to improve their energy efficiency, and handles all necessary paperwork.

At present, there is no such ease of access. Customers face considerable hurdles if they wish to install micro-generation. Homeowners must prove they already comply with a number of energy efficiency

---

targets. They have to apply for government grants, which require forms to be filled in, with the grants themselves often turning out to be unavailable by the time they are applied for. They must endure an often lengthy planning process. Finally, customers determined enough to overcome all these bureaucratic barriers then have to install the generator itself, together with new metering equipment, with no service available to make all of this simple and easy.

No doubt, if left to itself, the market will cure these ills – in time. The cost of micro-generating technology will fall (due to technological development prompted by the mass markets in other countries). The need for financial support from the Renewables Obligation Certificate scheme and from government grants will fall away. And the retailers and energy service companies will step in to provide easy financing and installation packages.

But without decisive action now to create a radically new system of support, all of this is likely to happen much too late to enable micro-generation to play any meaningful part in enabling the UK to meet its energy security needs or its carbon reduction targets.

To create a micro-generation mass market quickly, and to make micro-generation in England progressively become the norm rather than the exception, we need to make purchase of micro-generating equipment cheap and easy. We will stimulate new markets for locally generated electricity by rewarding self-generators for their own low carbon electricity, and incentivising them to sell back any surplus to their local electricity network. To do that we need to introduce a system of long-term feed-in tariffs.

Long-term feed-in tariffs are the primary support instrument for decentralised, low carbon micro-generation throughout continental Europe. With a feed-in tariff, a fixed price is paid for the electricity produced from decentralised, low carbon energy sources, usually with different technologies. In Germany, for example, the basic tariff paid for electricity generated from solar photovoltaics was €0.518 / kWh in 2006, whereas tariffs paid for electricity generated from large-scale wind power were €0.0836 / kWh.

To make the system in England as simple as possible, we propose that:

• a tariff should be paid for each kilowatt-hour generated by a low carbon micro-generator of a given technological type (photovoltaic, CHP, etc.). The owner will be paid for the gross amount generated, not just the net amount exported to the local network;

• the household that installs the micro-generation will continue to pay the normal, prevailing price for the electricity they consume;

• the two amounts – the tariffs received for generating and the tariffs paid for electricity consumed – will be shown on an electricity ‘statement’ that replaces the conventional electricity bill, and will be netted off against one another:

  \[\text{[feed-in tariff x amount generated]} - \text{[electricity tariff x amount consumed]} = \text{net electricity income earned}\]

To avoid replicating the burdensome bureaucracy associated with the current grant applications, it is of the utmost importance that access to the new feed-in tariffs should be simple and universal.

In the late stages of consideration of the Energy Act, the Government conceded to Conservative pressure and introduced Government amendments which will enable the establishment of a scheme of feed-in tariffs to encourage small-scale low carbon generation of electricity, with a maximum upper limit of five megawatts (5MW). The Energy Act amendments only enable the introduction of a feed-in tariff scheme. Details of the Government’s scheme and its funding arrangement have yet to be published but we set out our own proposals below.

We propose that any individual or organisation using an accredited professional to install a certified low carbon generating appliance of below 5MW should automatically be eligible to receive feed-in tariffs for electricity generated, without having to do anything more than sign a standardised contract with their electricity supplier.
This universal entitlement can be built on the existing UK micro-generation certification scheme – which provides certification of micro-generation appliances and grid connection, and also provides accreditation for installers.

To make a reality of universal access, we will legislate to require electricity suppliers to produce standardised contracts containing the feed-in tariff, to sign such a contract with any customer installing certified equipment, and to provide a statement to customers who have installed micro-generation. This statement will show the cost of electricity supplied to the customer as well as the amounts owing to them as a result of electricity generated by their micro-generator.

We will legislate to give the Secretary of State the power to set feed-in tariffs for each form of nascent micro-generation technology. The legislation will require the Secretary of State to set long-term (e.g. twenty-year) tariffs, which will apply to electricity generated by each form of low carbon micro-generation technology installed during the first five years of operation of this scheme. It will also require the Secretary of State to conduct a review of the initial tariffs after the first three years, and to set new long-term tariffs which will apply to electricity generated by low carbon micro-generators established after the fifth year of the scheme. Similar reviews will occur at five-yearly intervals thereafter.

Such a system of pre-set, long-term tariffs will ensure that people investing in micro-generation (and the financial institutions arranging financing for them) have a high degree of certainty about the amount they will be able to earn over the years from generating electricity. Since it is possible to make reliable predictions of the output from given renewable micro-generation technologies installed in given places, the availability of a pre-set price for generation will make it possible for the investor and any provider of finance to calculate the amount that will be available to meet the financing costs.

We therefore envisage that householders will be able to obtain comprehensive and simple commercial financing packages for the installation of micro-generators once feed-in tariffs are introduced. But setting pre-set, long-term feed-in tariffs of the sort we propose, should allow normal commercial finance packages to be constructed that will cover a large part of the initial cost of the installed appliances.

We attach considerable importance to this feature of our proposals. In order to create momentum behind micro-generation and decentralised energy in England, and in order eventually to realise the economies of scale that will derive from mass take-up of micro-generation, we need to make it as easy to buy micro-generation as it is to buy a mobile phone.

Because of the fixed, long-term nature of the feed-in tariff, acceptance by a householder of a finance package need not create an additional burden of net household debt. The stream of revenue from generation of electricity will be sufficiently predictable to support the financing cost.

**Reform of the Microgeneration Certification Scheme**

To achieve our ambition for a decentralised energy revolution, consumer confidence in microgeneration products and installers is essential. The Microgeneration Certification Scheme (MCS), sponsored by the Government, is designed to ensure microgeneration products and installers meet robust standards for microgeneration technologies as described in Section 4. But the current scheme acts as a barrier to the introduction of microgeneration in the UK. The certification fees and the time-intensive certification assessment unnecessarily add significant cost, tie up resources and place a disproportionate burden on SME installation companies. Moreover, the lack of integration and recognition of other accredited certification schemes is a key cause of the cost and bureaucracy.

We will reform the MCS so that it becomes part of CORGI – the scheme that already offers quality assurances for gas, plumbing, electrical and ventilation work, providing market leading technical advice and support for competent people in these areas.
6.2 New market signals in energy for industry and households

New market signals for biogas

The advantages of a decentralised energy revolution are not limited just to the electricity supply industry. Similar market signals can also be used to stimulate a decentralised energy revolution in the gas supply industry.

To realise the potential for biogas, we need to (as described in Section 5.2) mandate National Grid – through appropriate changes in the regulatory regime – to accept bio-methane into the gas grid. But this is not enough. To match the new network access regime, we need to introduce a system of long-term feed-in tariffs for biogas.

With a gas feed-in tariff, a fixed price is paid for the gas produced from decentralised sources that make use of anaerobic digestion technologies.

To make the system as simple as possible, we propose that a regulated tariff should be paid to the generator for the amount of biogas exported to the grid.

As the net amount of natural gas consumed from the gas grid would be reduced by the amount of biogas, it would be natural for the regulated price to equal the retail price of gas supply, with (1) a set discount to reflect the cost of maintaining the gas grid and the distribution network, and (2) a set premium to recognise the savings to the system from the reduced need for gas storage.

New market signals for Low Carbon Heat

Decentralised generation also offers the opportunity to capture heat which can then be used for domestic or commercial purposes. This is a particularly attractive source of heat and electricity to lower income households as it is well suited to social housing and the fuel poor. Conservatives campaigned for the provision of heat in the Energy Bill. Again in the late parliamentary stages of the Bill, the Government conceded and introduced amendments which will allow for a ‘renewable heat incentive’ for all scales of projects to be funded by a levy on fossil fuel suppliers. Details of the Government’s renewable heat incentive scheme have yet to be published but we set out our own proposals below.

We propose the establishment of a ‘heat tariff’ system to facilitate and encourage low carbon heat which is either produced on the premises or sold directly to consumers. A system of clear long term tariffs in the form of payments on a technology specific basis set according to set metrics but also according to the carbon intensity of the generation. All tariffs are necessarily capped by delivered heating loads and subject to fulfilling appropriate insulation requirements. Tariffs would be reviewed at fixed intervals according to the parameters described.

We will expand the definition of heat to include non-renewable low carbon heat sources such as CHP, industrial heat capture, ground and air source heat pumps to ensure these important technologies get the support they deserve.

New market signals for zero carbon homes

Since 1985, Part L of the UK Building Regulations, which sets standards relating to the conservation of energy, has been used progressively to raise the energy efficiency standards for new buildings. The current energy efficiency requirements in new and refurbished commercial buildings of 1000m$^2$ are 28% more stringent than the previous regulations. In addition, developers refurbishing a property of over 1000m$^2$ will be required to ensure that the whole building complies with the new Part L unless “it is not technically, functionally and economically feasible”.

There are further market signals that can act as financial incentives to reduce household consumption of fossil fuel. As a nation, we rate the worst in Europe for wasting energy; a report by the Energy
Saving Trust found that the average home has around 12 unused electrically powered devices drawing from the grid at any one time.62

We want to use incentives to get people to the point where it becomes the norm to make cost-efficient low carbon choices in their existing homes – such as installing low energy light-bulbs and effective roof and cavity wall insulation, as well as saving energy by switching off appliances when they are not being used.

**Energy Performance Certificates**

The most urgent challenge in reducing carbon emissions from housing is to dramatically improve the energy efficiency of existing housing stock. Carbon dioxide emissions from the housing sector have risen by more than 5 per cent since 1997 and currently account for 27 per cent of the UK’s carbon footprint.63 When one considers that 75 per cent of the existing housing stock of 25 million homes will still be in use by 2050, the need to give consumers incentives to make their homes more energy-efficient is clear. One signal that will create just such a behavioural shift is the Energy Performance Certificate (EPC).

In contrast to the Government’s plans to extend the unpopular, bureaucratic and controversial Home Information Packs (HIPs), we have continually asked the Government to press ahead with the implementation of EPCs, free from the additional encumbrance of the rest of the HIP. EPCs are required under the EU Directive 2002/91/EC, but in Northern Ireland EPCs have been in use since July 2008 for house sales without the need for HIPs. The administration in Northern Ireland does ‘not believe that a Home Information Pack is necessary to ensure compliance with the Directive’.64 Even the Government’s own Better Regulation Commission has warned that England’s HIPs have imposed “additional administrative burdens without adequate justification” which “goes beyond the requirements of the directive”, with “no supporting evidence to justify this gold plating”65.

EPCs are, therefore, a means of providing prospective householders with information about the current and potential energy efficiency of their homes, the measures they can take to realise that potential, and where to go for further advice on these measures, including for financial assistance. Ultimately, as they become an established part of the property market, it is expected that they will have a significant impact on buying and renting decisions, creating an incentive for property owners and landlords to make energy efficient improvements to attract buyers or tenants.

We recognise our obligations under the EU Directive 2002/91/EC to introduce EPCs, and we believe that, if people are to benefit fully from an EPC, there needs to be a comprehensive review of how these certificates are implemented. There needs to be greater flexibility; certificates should be required only at the end of the sale process, rather than at the point of marketing, in order to avoid distorting the housing market. We also want to introduce greater competition in the market for the provision of EPCs – for example, involving CORGI gas inspectors and utility companies – to help drive down their cost.

**Energy Efficiency Retrofit in Homes – the ‘Just Do It’ scheme**

One of the striking features of the current housing stock is how many homes, if retro-fitted with energy saving technologies such as cavity wall insulation, loft and boiler insulation and low-energy boilers, could reduce fuel bills to pay back the costs of taking the measures within five years – and even, in some cases, within the year of fitting.

---

63 Friends of the Earth, *Emissions from UK homes could be slashed by 80 per cent reveals new research*, press release, 27 November 2007.
Government programmes to retrofit energy efficiency improvements to existing homes – including Warm Front and CERT – have reduced bills and emissions for those energy customers who have taken up their entitlements. But in the interests of both economy and reducing emissions there remains a great opportunity to make a step change in the coverage of energy efficiency measures across the housing stock.

What are the barriers which prevent householders from investing in technology that has a positive financial return?

There are three principal barriers:

- difficulty in finding the initial capital outlay required, even with the prospect of early savings in outgoings;
- actual or perceived short-term tenure dissuading householders from investing in improvements the benefits of which would accrue to future homeowners or tenants; and
- the transaction costs in arranging for the work to be done – i.e. the ‘hassle factor’.

A Conservative government would take steps to overcome each of these barriers by giving all householders the right to obtain immediate investment in energy saving technology. We would achieve this by granting an entitlement to households to approved home energy efficiency works up to a value of £6,500 the costs of which would then be recovered automatically through the household energy bill over a period up to 25 years – but with a payback, in terms of reduced fuel consumption, period substantially shorter than 25 years. This would mean that the household would benefit immediately from lower fuel bills.

For example, the UK Green Building Council (UK-GBC) estimates that even on very conservative assumptions\(^{66}\) a basic package of around £1,700 of energy efficiency measures (including cavity wall insulation, new boiler controls, and loft insulation) to a three bedroom semi-detached house would reduce bills by an average of around £160 per year, even after taking into account the financing cost. For properties without cavity walls - which have until now benefited less from energy efficiency improvements - a package of around £6,000 of improvements (including solid wall insulation) would cause bills to fall by an average of about £150 per year after account is taken of the financing cost.

Because everyone would be able to upgrade their home energy efficiency with no upfront costs and immediate savings on their bill, there would be no obstacle to people improving the energy efficiency of their home. This scheme would operate in conjunction with CERT and Warm Front and because of the increased take-up of energy efficiency improvements we would increase the CERT target on energy companies so that they continue to make their current financial contribution so achieving major additional reductions in CO\(_2\) emissions.

We anticipate that whole streets will be retrofitted at the same time – building on the Warm Zones approach taken by Conservative-led Kirklees Council, allowing economies of scale to be achieved in installation.

We would use statutory measures to allow the capital recovery to be attached to the network element of the domestic bill (to the element that goes to the district network operator (DNO) and to National Grid), so that in the event of a change of energy supplier, the charge stays with the property, rather than moving with the customer.

We will consult during the months ahead on whether the best model is, like CERT, to operate this entitlement through the existing energy companies or through local authorities, or to create a separate vehicle to authorise commission, supervise and finance the work carried out. We will also consult on what the appropriate financial limits for implementation should be.

---

\(^{66}\) That domestic fuel prices start at 33% below today’s actual level, and rise by only 3% a year in real terms (so that they do not reach today’s actual level until 2017).
We will consider the appropriate level of the financing charge for the capital value of the works. We anticipate that, on the basis of the government guaranteeing the financing in return for a market based insurance premium of say 1 per cent (so there would be no cost to the public purse), and given current long-dated gilt rates, the financing cost would at present be about 5 per cent per annum.

As has been achieved in Germany, this ‘Just Do It’ approach will provide a step change in the energy efficiency of UK homes.

In doing so, it will:

• reduce people’s fuel bills and cut fuel poverty;
• sharply reduce Britain’s emissions of CO₂;
• provide an immediate boost to the building and construction industries, creating jobs in the recession; and
• improve the value of people’s homes.

**Low Carbon Zones**

The Conservatives’ Quality of Life report put forward proposals to improve the energy efficiency standards of existing properties through a Low Carbon Zone approach, whereby specific zones would be identified that would be seed-funded by central government to undertake low carbon initiatives.

The Mayor of London, Boris Johnson, in July announced the development of ten high technology ‘Low Carbon Zones’ across London by 2012 which will provide a range of services and technologies to households and businesses including: home insulation, buildings retrofitted with energy efficient devices, locally generated renewable energy schemes, plus energy and carbon assessments to work out existing carbon footprints and how best to reduce them.

We accordingly propose to evaluate the ten pilot Low Carbon Zones and hope to extend the zonal incentives nationwide.67

**Business/Employee Carbon Cooperation Plan schemes**

We will allow employers who are subject to mandatory schemes that require them to cut carbon emissions to count carbon reductions they achieve in employees’ homes towards their own emissions reduction targets. This will include businesses and organisations such as (but not exclusive to) those required to participate in the Carbon Reduction Commitment trading scheme (around 5,000 organisations with a 2008 half-hourly metered electricity use above 6,000 MWh).

The carbon reductions will be calculated by reference to a standard list of improvements and measured by before-and-after changes in home Energy Performance Certificates. The reductions will be counted for a number of years and would remain even if employees left the company.

**Wider access to zero carbon goods and services**

We propose the introduction of a new standard, similar to the Japanese ‘Top Runner’ scheme which identifies the most efficient appliances on the market in different categories – reflecting the rapid pace of product development – and then requires all competing brands to improve on them within four to six years.68

---


To inform consumer choice further, the mandatory EU energy labelling scheme should be extended from white goods to brown goods. Significant energy efficiency gains have been achieved with white goods, but they have been largely offset due to the exponential increase of consumer electronics, such as digital boxes and plasma screen televisions. Under EU Single Market rules the UK cannot by itself require any freely traded product to carry an energy efficiency label. Such action will need to be taken at EU level. We will accordingly continue to press the European Commission for the expansion of the EU Energy Labelling Scheme to cover a wider range of products including consumer electronics.

**Household energy-use comparisons**

One of the biggest influences on our behaviour is what we think is expected by the society around us and what we see other people doing. So, if we see that all our neighbours’ recycling bins are full, we end up recycling more ourselves. Research in America has shown that the same is true for energy efficiency – if we find out that our neighbours, or that households similar to ours, are using half as much energy as we are, then we are much more likely to bring our own consumption down in line.

We will, therefore, ensure that every gas and electricity bill contains information which allows each household to compare their energy consumption with average households of a comparable size. This is not about government telling people what to do. It is post-bureaucratic policy making – not pulling bureaucratic levers from above and imposing a centralised view on the world, but understanding why people behave in certain ways, and then giving them a nudge in the right direction.

**Code for Sustainable Homes**

Whilst we recognise that the majority of carbon emissions come from existing housing stock, there is great opportunity to build a new generation of zero carbon homes. We believe that all new communities from 2016 should be zero carbon. This will be achieved by ensuring that newly built developments will use the latest technologies available combined with renewable energy sources to create communities that will not emit any additional CO₂. To bring about this aim we will take immediate steps to work with all interested parties to create a universally-accepted definition of zero carbon.

**The Planning and Energy Act (The Merton Rule)**

A further contribution to reducing emissions from housing can be made by allowing local councils to insist on renewable energy as a component of new development – in effect, using the incentive of planning gain to bring about a significant increase in low carbon energy production.

The Merton Rule, introduced in 2003, allows a local council to stipulate that new developments in its area (above a certain size) should generate at least 10 per cent of their energy needs from on-site renewable energy equipment. The most commonly accepted threshold is 10 homes or 1,000m² of non-residential development.

---

**The Merton Rule:**

‘The council will encourage the energy efficient design of buildings and their layout and orientation on site. All new non-residential developments above a threshold of 1,000 sqm will be expected to incorporate renewable energy production equipment to provide at least 10 per cent of predicted energy requirements.’

---

69 Memorandum submitted by the Chartered Institute of Housing to the House of Commons Communities and Local Government Committee, 17 March 2008.

70 Merton Council, *What is the Merton rule?*;
http://www.merton.gov.uk/living/planning/planningpolicy/mertonrule/what_is_the_merton_rule.htm
The principle is that where the incorporation of renewable energy equipment would make the development unviable it will not be expected. So, for example, for technical reasons it may not be possible to mount PV panels or wind turbines on a roof.

Michael Fallon MP’s Planning and Energy Private Members’ Bill gave local authorities statutory powers to set renewable and low carbon energy targets for new development, and requires developers to source at least 10 per cent of any new building’s energy from renewable sources, reinforcing the Merton Rule and implementing it on a national scale. We are pleased that this Bill was granted Royal Assent and we will ensure that this legislation is implemented in full.

**Energy Efficiency Retrofit in Commercial Buildings**

Efforts to improve the environmental performance of non-domestic buildings have primarily targeted new buildings and the Conservative Party supports the Government target that new non-domestic buildings must be zero carbon by 2019. However existing non-residential buildings (offices, hotels, retail and industrial buildings) represent a significant opportunity to achieve carbon emission reductions and must be addressed rather than be overlooked.

The most cost-effective way of increasing the energy efficiency of existing buildings is when they undergo major renovation, often at the occasion of lease breaks, and these are precisely the occasions that should be used to enhance the efficiency of existing stock. The Royal Institution of Chartered Surveyors (RICS) believes that if the right incentives are put in place, more energy efficiency retrofit work should be possible.

A supportive policy framework would also stimulate demand and reduce the costs of energy efficiency technologies. We propose to implement fully the Energy Performance in Buildings Directive (EPBD) and require Display Energy Certificates (DEC) for private as well as public non-domestic buildings over 1000m².

The Conservatives Quality of Life Report acknowledged that the large proportion of UK commercial sector stock owned by large institutional investors and leased to tenants is often cited as a major obstacle to retrofitting for energy efficiency. This is because the direct benefits of lower energy bills do not accrue to the party most easily in a position to invest in the necessary energy efficiency measures. We will examine the possibility of making available loan finance for energy efficiency retrofit of existing buildings in a forthcoming policy paper.

**6.3 New market signals for biofuels**

Once regarded as a potential panacea, the reputation of biofuels has taken a pounding over recent months. We voted against the Government’s Renewable Transport Fuel Obligation (RTFO) because it does not contain binding safeguards to ensure that the biofuels it promotes come from sustainable sources. Nor does it take into account the impact of biofuels on food production. The evidence is clear that the wrong kind of biofuel, particularly those produced from palm oil feedstocks, can be environmentally damaging rather than beneficial. It is acutely perverse for the RTFO to be encouraging people to destroy the rainforest – an invaluable carbon sink as well as a haven for wildlife - to produce biofuels or crops displaced by biofuel production elsewhere. We also need to see safeguards to ensure that biofuels do not have an adverse impact on global poverty by driving up food prices.

That said, we believe the right biofuels can play a useful role in reducing emissions once mandatory sustainability rules are in place. There are biofuels available at present as part of the so-called “first generation” which can be reconciled with the concerns set out above. We also fully recognise the potential benefits of “second generation” biofuels in reducing carbon emissions, and their role in the emerging bio-economy, as described in Section 4.

71 Royal Institution of Chartered Surveyors, *Energy efficiency in commercial buildings*, 17 August 2007
In the long-term, while technological developments in electric vehicles could make biofuels for passenger vehicles obsolete, it may well be that they will continue to play an important role in fuel for lorries and trucks, aviation and for providing chemicals.

A Conservative government would put in place binding sustainability rules for existing biofuels.

Once a reliable framework on sustainability is in place and with progress underway on bringing second generation biofuels to the market, we would accelerate the uptake of biofuels by establishing more ambitious targets than those currently contained in the RTFO.

6.4 New market signals to change behaviour

Low Carbon Savings Accounts

Crucial to the move to a low carbon economy is the principle that economic prosperity and tackling climate change can go hand in hand. Environmental action is about what we can do together; how we can create whole new industries and jobs around a new green technology and the financial structure that will make that happen.

In February 2008, the Shadow Chancellor, George Osborne, announced that a Conservative government would look at Low Carbon Individual Savings Accounts, designed to enable the public to save more money than they currently are allowed tax free, provided these funds are invested in environmentally-friendly companies.

These Low Carbon ISAs will engage the public in a new way about the issues around climate change and demonstrate very clearly the economic benefits of green investment. They are also a perfect example of can-do environmentalism that is good for savers and green companies, as well as for the environment.

The Low Carbon ISA working group has been looking at criteria for listed companies to qualify as recipients for this investment product. They have been exploring using annual carbon reduction performance (reliant on standardised carbon reporting), possibly relative to sectoral performance. They have also been looking at how to ensure the ISA performs well enough to be attractive, its relationship to the standard ISA and how it would impact on large funds of various sorts that are involved in this market.

We were disappointed that the Government did not show greater leadership and urgency on the issue of mandatory corporate reporting in the Climate Change Act. Carbon disclosure by the UK’s largest companies would act as a significant driver of emissions reduction and create a competitive advantage in the corporate sector by establishing a level playing field, allowing consumers and investors to make meaningful comparisons. We will accordingly enhance by secondary legislation the powers of the Secretary of State and to bring forward the date that the largest companies are required to report on carbon emissions.

6.5 Reforming the Climate Change Levy

The Government has made it clear that the EU Emissions Trading Scheme (ETS) is the cornerstone of its policy framework to tackle climate change. The Environment Audit Committee said “it would seem no exaggeration to say that the Government has more staked on the success of this one policy instrument than perhaps any other”

We believe that the EU ETS will play a crucial role in any attempt to reduce carbon emissions. But we should reduce uncertainty over the future price of carbon. As emphasised by Stern, “in order to influence behaviour and investment decisions, investors and consumers must believe that the carbon

---

price will be maintained into the future.” The ETS is vulnerable to large fluctuations in the price of carbon, so taxation can help to provide a floor beneath which the price of carbon will not fall.

There is a legitimate role for government in providing businesses with stable long-term incentives to invest in energy efficiency and carbon reduction.

We will reform Labour’s Climate Change Levy, which currently fails to distinguish between the carbon emissions generated by the businesses which pay it. As a result, it provides no incentives for low carbon energy.

As we set out in our consultation document 'An effective Carbon Levy for the UK’, the Climate Change Levy needs to be replaced by a Carbon Levy so that it is a tax on carbon rather than on a tax on the supply of energy to business paid by the consumers of energy rather than generators.

The four principles that a reformed system should satisfy are that:

• The rates of a Carbon Levy should be more closely linked to carbon emissions in order to provide the right incentives for investment in low-carbon technologies;

• Any reforms should be revenue neutral overall for business, and should minimise the negative impact on the competitiveness of energy intensive sectors;

• A Carbon Levy should continue to exclude the domestic sector; and

• The system should provide a stable framework over the long-term, including compatibility with the EU Emissions Trading Scheme and future schemes.
7. Putting government’s own house in order

Government progress in making a low carbon public sector\(^{73}\) a reality is critical to the success of those measures which target action by consumers and business – Government is far better placed to ask individuals and business to change if its own house is in order. By using its purchasing power to encourage improved standards, Government can help to stimulate the market for more energy efficient construction, goods and services. Moreover, reducing public sector emissions will, as the Government itself says, ‘not only ensure the public sector plays its role in addressing climate change but also offers the prospect of better value for money for the taxpayer through decreased costs’.\(^{74}\)

The central Government estate

Including executive agencies, the central Government estate comprises over 650,000 employees working in buildings that occupy over 17,000,000m\(^2\) of building floor space with over 5,000km\(^2\) of land, equivalent to some 2 per cent of the UK’s landmass.\(^{75}\) The government spends billions of pounds each year on construction and refurbishment\(^{76}\) and buys £13 billion worth of goods and services each year – a figure which, for the wider public sector, rises to £125 billion.\(^{77}\)

Central government energy use accounts for over 806,000 tonnes of carbon emissions (about 0.5 per cent of the UK total, and equivalent to one-and-a-half times Tesco’s total emissions)\(^{78}\); and total public sector emissions are officially estimated to range from 3.7MtC to 5.5MtC\(^{79}\) – with the Office of Government Commerce reporting that total emissions may be as high as 8.3MtC – amounting to a range of some 2.5 to 5.5 per cent of UK emissions\(^{80}\).

It has been estimated by the National Audit Office that savings in energy and water consumption across the public sector could be at least £20 million a year\(^{81}\) and that implementation of good practice in respect of public sector construction could deliver potential annual savings of £500 million\(^{82}\). Yet Government departments are failing to meet carbon, waste and water targets to such an extent that Jonathan Porritt – Chairman of the Government’s watchdog, the Sustainable Development Commission, – has said:

---

\(^{73}\) By public sector we refer to the part of the economy that includes central government, local government and public corporations, as defined by the Treasury.


\(^{76}\) National Audit Office, Building for the future: Sustainable construction and refurbishment on the government estate, 20 April 2007.


\(^{79}\) Based on 2002 data from the Department of Trade and Industry.

\(^{80}\) Based on 2003 data from the Department of Trade and Industry.

\(^{81}\) National Audit Office, Building for the future: Sustainable construction and refurbishment on the government estate, 20 April 2007: “Energy consumption (gas and electricity) across departments and agencies costs £150 million a year. If energy consumption is reduced in line with targets by 15 per cent by 2010 and by 30 per cent by 2020, this will save £22.5 million per year by 2010 and £45 million per year by 2020, or more. Water consumption across the central government estate reached nearly three million cubic metres in 2004-05. Reducing consumption to the target level of three cubic metres of water per person per year would more than halve thus consumption, delivering savings of up to £1 million per year.”

\(^{82}\) If the Government were to follow recommendations from the National Audit Office’s 2005 report, Improving Public Services through better construction, cited in National Audit Office, Building for the future: Sustainable construction and refurbishment on the government estate, 20 April 2007.
‘Overall, Government performance is simply not good enough. Against a background of non-stop messages on climate change and corporate social responsibility, the Government is lagging so far behind the private sector, when it should be leading the way’.83

Local government

According to Office of Government Commerce, the energy consumption of local authorities is estimated to be at least 26 billion kWh per year. This results in annual CO₂ emissions of more than 6.9mt and corresponds to energy expenditure in the order of £750 million per year.84 The Local Government Association Independent Climate Change Commission's report - the first authoritative investigation into the performance of councils to reduce their carbon emissions found that many still have to put appropriate strategies and action plans in place. The report concluded that councils can help cut carbon emissions by 150 million tonnes of CO₂ a year, contributing to the national target of up to 32% reductions that central government has pledged to achieve by 2020.85

Public corporations

There are currently 374 public corporations controlled by central government, local authorities or other public corporations, including bodies such as the Royal Mail, BBC World Service and the National Health Service Estates.86 These companies receive more than half their income from the sales of goods or services into the market place but are recognised by HM Treasury and the Office for National Statistics as public sector and therefore should have a role to play in leading the way to a low carbon public sector.

The public sector under Labour

The Government has recognised the need for the public sector to play an important part in UK saving energy. In March 2005, Tony Blair announced ‘Government will lead by example’ committing every Government department to the delivery of an action plan outlining how to spend its budget in a more sustainable way.87 In October 2006, David Miliband remarked that ‘the household sector will only take the steps that are necessary if it sees Government taking a lead, even with its own emissions’.88

The Government’s action – its ‘taking a lead’ – has, for the most part, centred around targets. There is a target to reduce office carbon emissions by 12.5 per cent by 2010.89 Other plans include the funding of, and targets for, energy efficient new public sector buildings, as well as energy efficient procurement of new public sector cars and energy saving products, and targets to reduce waste and water consumption and to increase recycling.

However, recent reports from the National Audit Office and the Sustainable Development Commission, indicate that Government performance is falling far short of the step-change required to meet its own targets:

83 Jonathan Porritt in Sustainable Development Commission, Government fails to get its own house in order on carbon, water and waste, press release, 7 March 2007).
84 Carbon Trust, Local authorities sector overview, 26 June 2007.
88 David Miliband on Newsnight, BBC2, 30 October 2006.
Carbon: On average, departments have reduced carbon emissions by only 0.5 per cent since 1999, meaning that they are not on track to meet the carbon reduction target of 12.5 per cent by 2010. 15 departments have increased carbon emissions since 1999 and most Departments are using energy less efficiently than they did in 1999.

Waste: Departments generated more waste in 2006 than the previous year. Total waste increased from 163,847 tonnes to 186,380 tonnes.

Water: Departments failed to meet the target of 7.7m³ of water per person, consuming an average of 10.2m³ per person in 2006.

Travel: Emissions from public sector road transport have officially decreased by 14 per cent since 2002. However, this performance was devalued by the inability of eight departments to provide accurate data. The Department for Transport has increased its emissions by approximately 40 per cent since 2002.90

The Sustainable Development Commission has stated that overall performance is ‘hugely disappointing’.91 The National Audit Office report – which concentrates on sustainable construction across the government estate – found ‘widespread failure to meet targets’.92

Making a low carbon public sector a reality

We believe that the public sector must provide a much stronger example in the UK’s move towards a low carbon economy.

The Conservative Quality of Life Policy Group report recommended that an incoming Conservative government should ‘use public sector financial and political muscle to entrench sustainable purchasing decisions and favour green companies; set a timetable for spending a growing proportion of public procurement with companies accredited as carbon neutral; adopt clear car procurement policies across all parts of the public sector; set the highest possible energy performance standards in buildings of the public estate; and establish supply chains for use of local and low carbon food’.93

The Quality of Life Policy Group report also recommended that an incoming Conservative government should establish proper baselines for reducing carbon emissions with transparent annual targets, metrics and reporting: ‘central and local government must provide transparent reporting on emissions, with local authorities compared against one another’s performance and all public sector buildings should publicly display their whole carbon footprint in terms of energy use, waste minimisation and water efficiency’.93

We will work with the civil service to develop implementation plans for all these recommendations. For example, we will adopt clean car procurement policies across all parts of the public sector. We also believe that buildings of the public estate should be in the top quartile of energy performance. By driving the highest standards of energy efficiency and carbon emissions reduction, the public sector’s impact on the construction industry will have a very strong effect on the private sector too. A concerted effort by government to set appropriate standards would have a significant effect on developers, engineers, construction companies and facilities managers, and would drive the skills and the attitudes necessary to deliver and operate low carbon buildings across both public and private sector.

90 Sustainable Development Commission, Government fails to get its own house in order on carbon, water and waste, press release, 7 March 2007.
93 Quality of Life Policy Group, Blueprint for a Green Economy, September 2007.
However, it will not be enough simply to introduce transparent reporting and carbon conscious procurement. A Conservative government will also seek transforming technological approaches to alter the way that the business of the public sector is carried out. For example, with new ‘TelePresence’ technology, it is now possible to provide broadcast quality links between meeting rooms in different parts of the country that enable meetings to occur almost as if the participants were in the same room. A Conservative government will expand the piloting of TelePresence in the Department for Innovation, Universities and Skills immediately, and monitor the effects. If, as we expect, there are both significant carbon reductions and significant cost-savings through reduced travel, we will implement this technology throughout central government and its agencies.

We believe that, by driving the highest standards of energy efficiency and carbon emissions reduction, the impact of the public sector on the construction industry should have a strong knock-on effect to the private sector. From developers, to architects, engineers, construction companies and facilities managers, the skills and mentality to deliver and operate low carbon buildings should then develop quickly across both public and private sectors.

The creation of a new Department of Energy and Climate Change was a welcome move but the watchword is delivery. Drawing on the positive precedent of the creation of a new Office of Nuclear Development (OND), then within BERR, to facilitate new nuclear investment in the UK, we will look to create dedicated teams to facilitate the delivery of the necessary transformative physical infrastructure. We will accordingly come forward with proposals for the restructuring of the new Department and its agencies to ensure a sharper focus and delivery of our low carbon agenda.

We welcome responses to this consultation paper. Please send comments via email to ryan.tinggal@conservatives.com