HM Government

Department for Business, Innovation and Skills
Department of Energy and Climate Change

The UK Low Carbon Industrial Strategy

ACT ON CO2

Building Britain's Future

We will work closely with the Devolved Administrations in Northern Ireland, Scotland and Wales, recognising their particular and varying responsibilities. While some of the policies in this paper are specific to England, the challenges are common across the four countries of the United Kingdom. Each will consider the most appropriate arrangements in those areas for which they have devolved responsibility, to address the issues in ways that meet their own circumstances and needs.




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Foreword

Tackling climate change is about more than just averting environmental disaster. It can create a better kind of society and a stronger, more sustainable economy.

There are tangible, immediate benefits for business. It can ensure that our economy emerges from the global downturn at the forefront of the technological and social shift that will define the next century.

Securing these benefits means recognising the urgency of action. The world is engaged in a race to low carbon, and acting early will mean we are positioned for the new industries that are being created. The global market for low carbon goods and services is already worth around £3 trillion a year, and will probably grow by half that again by 2015.

Already, almost 900,000 people work in the low carbon sector or its supply chain in the UK, not just in green manufacturing but in green services like consultancy or low carbon venture capital. If we act early, we can leverage immense existing industrial and business strengths.

The UK's new carbon budgets show how quickly carbon savings must be made. Compared to 1990 levels of greenhouse gas emissions, we know we need to save 22 per cent by 2012; a third by 2020; and 80 per cent by 2050. *The UK Low Carbon Transition Plan*, published for the first time alongside this document, shows sector-by-sector how these savings can be made, and how the costs of transition can be fairly distributed.

As well as urgency, we need to recognise the need for both competitive markets and government action. Competitive markets need additional investment for the early stages of innovation and to ensure that successful low carbon companies can access finance as they grow. In the coming months, further investment from the £405 million for low carbon industries and advanced green manufacturing announced at the Budget will reach companies on the ground.

Competitive markets work best, too, when there is additional action to position particular regions in ways that play to their strengths – such as the South West's potential to lead the world in wave and tidal power, or the potential of clusters of industries using carbon capture and storage.

The UK Low Carbon Industrial Strategy offers a strategic view of Britain's low carbon strengths and opportunities, detailed actions, and a solid basis for cross-Whitehall implementation. Businesses around the country are now rising to the challenge. Together, we can create British leadership in new industries, help British companies save resources and equip ourselves with the new skills required. We can set out a powerful, more positive, vision of the society we can build by tackling climate change.

Peter Mandelson

Ed Miliband

Executive summary

i The transition to a low carbon world will transform our whole economy. It will change our industrial landscape, the supply chains of our businesses and the way we all live and work. The vast majority of, if not all, economic activity in Britain will have to reduce its carbon impact significantly.

ii In driving the move to a low carbon economy, the combination of both the massive dynamism of the private sector and a strategic role for government will help ensure that we can make the most of the potential benefits for innovation, growth and job creation in Britain.

iii This will be a global transition. Governments from across the world are now putting in place policies that will reduce carbon emissions, creating a greener global economy, and an entire economic sector driven by the demand for low carbon goods and services.

iv The move to a low carbon economy will bring costs as well as economic benefits for Britain. But the costs of inaction will be far greater than the costs of action.

v The core objective of this strategy is to ensure that British businesses and workers are equipped to maximise the economic opportunities and minimise the costs. They will do this both by catering to growing British and global markets for low carbon goods and services, and also by using energy and other resources more efficiently to reduce costs. The Government will aim to make the transition in a way that ensures a fair distribution of costs and benefits across the economy.

vi Building on the framework for supporting British business set out in *Building Britain's Future: New Industry, New Jobs*[1], this strategy sets out both the scale of these potential opportunities and a programme of government action for assisting

[1] HMG (2009) Building Britain's Future: New Industry, New Jobs, www.berr.gov.uk/files/file51023.pdf

British based firms in seizing them. In parallel to this document, the Government is also publishing *The UK Low Carbon Transition Plan*[2], *The UK Renewable Energy Strategy*[3] and *The Carbon Reduction Strategy for Transport*.[4] Together these set out the policies, including in the areas of energy efficiency and renewable energy which, combined with encouraging consumer and business demand for low carbon goods and services, will help drive the transition to decarbonising our economy, and reflect how departments across Government are working together to deliver the transition to a low carbon future.

vii At the heart of this strategy are three basic principles for a positive environment for low carbon business:

- a long-term strategic approach from government that sets stable frameworks for businesses and consumers;
- a pragmatic approach to the role of both markets and government in making the transition to low carbon quickly and effectively, recognising that the need to progressively increase the cost of carbon, encourage low carbon innovation, remove barriers to market for some low carbon technologies and adapt to inevitable climate change, will require intelligent intervention from government;
- a recognition that government has a responsibility to ensure British-based companies and people are equipped to compete for the new demand created by global climate change policies.

The low carbon opportunity

viii The global market for low carbon and environmental goods and services (LCEGS) was already worth £3 trillion in 2007/08[5]. As international action on climate change gathers momentum, this could grow to an estimated £4.3 trillion by 2015 – or potentially more, if boosted by an ambitious global climate change agreement at Copenhagen this December.

ix Britain already has a strong base. The UK low carbon environmental goods and services (LCEGS) market is worth £106 billion and employs 880,000 people directly or through the supply chain. It is estimated that over 1 million people will be employed in the LCEGS sector by the middle of the next decade. These are skilled jobs, with the average market value per employee well above the national average. The UK LCEGS sector is one of the few areas of the economy expected to maintain positive growth rates through the downturn and is expected to grow by over 4% per annum up to 2014/15.

x There have been multiple studies assessing Britain's opportunities in the move to a low carbon economy. This strategy has used these analyses to identify the greatest

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[2] HMG (2009) The UK Low Carbon Transition Plan, www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[3] HMG (2009) The UK Renewable Energy Strategy, www.decc.gov.uk/en/content/cms/what_we_do/uk-supply/energy-mix/renewable/res/res.aspx

[4] DfT (2009) The Carbon Reduction Strategy for Transport, www.dft.gov.uk/carbonreduction

[5] Innovas (2009) Low Carbon and Environmental Goods and Services: an industry analysis, www.berr.gov.uk/files/file50253.pdf

areas of economic opportunity for Britain, and to develop a picture of where market conditions are allowing British firms to exploit durable competitive potential and where, conversely, barriers to market or market failures may be preventing this.

Removing barriers to market in low carbon sectors

xi This strategy sets out where the Government believes opportunities are greatest and the further action that will be taken to address market failures and barriers to help unlock these opportunities for British based firms.

xii As set out in *New Industry, New Jobs*[6], the intention is not to support particular technologies or sectors on principle, but to target areas where Britain has the potential to take a leading global role, and where proportionate government intervention can unlock long-term competitive potential for British based firms. This does not mean that the sectors identified here are the only ones with growth potential; there will be other sectors, including other renewable technologies, which will play an important role in the move to a low carbon economy.

xiii Alongside a wide range of support and policy announced over the last year, this strategy sets out further action, including the first investments from the £405 million for low carbon industries and advanced green manufacturing announced at Budget 2009. Key announcements include:

- **Offshore wind**. Up to £120 million to support the development of a British based offshore wind industry. With tens of thousands of miles of coastline, shallow waters and high average wind speeds, Britain is, and will remain for the foreseeable future, the largest single market for offshore wind in the world.
- **Wave and tidal power**. Up to £60 million for a package of measures which will help accelerate the development and deployment of wave and tidal energy in the UK and cement our current position as a global leader in this sector. This includes almost £30 million to capitalise on Britain's wave and tidal sector strengths including investment in a major demonstrator facility for new technologies in Cornwall, as well as new support for the testing facilities at the New and Renewable Energy Centre (NaREC) in Blyth, Northumberland, to provide testing infrastructure for marine drive systems and other critical wave and tidal energy device components; up to £8 million to fund expansion of testing facilities at the European Marine Energy Centre (EMEC) in Scotland; and up to £22 million for a Marine Renewables Proving Fund to support testing and demonstration of pre-commercial renewable devices.
- **Civil nuclear power**. The Government will provide capital investment of up to £15 million in order to establish a Nuclear Advanced Manufacturing Research Centre consisting of a consortium of manufacturers from the UK nuclear supply chain and universities. The facility will enable around 30 companies to work together on the development and production of high quality nuclear components, and to achieve the necessary accreditation to supply this industry.

[6] HMG (2009) Building Britain's Future: New Industry, New Jobs, www.berr.gov.uk/files/file51023.pdf

Rolls-Royce will take a leading role – bringing technical ability, commercial discipline and access to markets.

- **Ultra-low carbon vehicles**. Further funding of up to £10 million for the accelerated deployment of electric vehicle charging infrastructure in the UK and the establishment of a cross-Whitehall Office for Low Emission Vehicles (OLEV) that will drive policy delivery. This will support infrastructure in a number of UK cities and will build on the previously announced £20 million to tackle barriers in electric vehicle charging infrastructure through the 'Plugged in Places' electric vehicle infrastructure framework. It will also complement the £230 million already announced to reduce the price to consumers of electric and plug-in hybrid cars from 2011.
- **Renewable construction materials**. The Government is investing up to £6 million to construct 60 or more low carbon affordable homes built with innovative, highly insulating renewable materials.
- **Renewable chemicals.** £12 million for a new open access demonstrator facility for fermentation of up to 10 tonnes for industrial biotechnologies, and a fund of £2.5million over the next two years to support SMEs in using the facility.
- **Low carbon manufacturing**. A £4 million expansion of the Manufacturing Advisory Service, to provide more specialist advice to manufacturers on competing for low carbon opportunities, including support for suppliers for the civil nuclear industry.

xiv Building on the analysis in this strategy, further investments from the funding announced at Budget 2009 will follow in the months ahead.

Developing low carbon economic activity across the country

xv There is clearly a set of low carbon activities and priorities which must be common across all parts of Britain. These include greater energy efficiency, smarter low carbon procurement and the construction or retrofit of low carbon buildings. But each nation, region and locality has a particular set of low carbon challenges and capabilities of its own. Understanding these is critical to effective policy delivery.

xvi For this reason the Government is developing 'Low Carbon Economic Areas' to accelerate low carbon economic activity in areas where Britain's existing geographic and industrial assets give a locality clear strengths.

xvii The first Low Carbon Economic Area will be located in the South West of England and will focus on the development of marine energy demonstration, servicing and manufacture. The South West has an obvious marine resource, successful existing activity with high potential and a high level of regional expertise in marine research, development and engineering.

xviii There is a clear regional commitment to collaboration between the Regional Development Agency and other partners to develop this low carbon economic opportunity through the creation of new demonstration facilities for wave and tidal power; investment in world class academic and research strengths; the

creation of a network of science parks and businesses to generate growing momentum in the wave and tidal power sector; new port infrastructure to ease the loading and transport of tidal and wave technologies to offshore locations; and the creation of an industry forum based in the region.

xix The South West will network with organisations in other parts of the country that are engaged in marine energy projects, including Scotland, the North East, the North West, Wales and Northern Ireland.

xx Over the next six months, central government will work with national, regional and local partners to identify further Low Carbon Economic Areas, examining where key opportunities exist, where there are local and regional advantages and where local partners are strategically aligned and focused on delivery. Sectors where we will particularly look to develop such areas will include offshore wind, marine energy generation, the nuclear energy supply chain, carbon capture and storage, and ultra-low carbon vehicles.

Growing innovative low carbon businesses in Britain

xxi Companies commercialising innovative low carbon concepts will be central to the transition to a low carbon economy in Britain. While the range of innovations that will underlie the shift to a low carbon society and economy is ultimately very wide, the innovations that will drive sustainable economic growth will be those that develop a low carbon concept into a commercial product or service. This journey from concept through commercialisation into a successful company is critical to making Britain one of the best places in the world to build innovative green businesses.

xxii The Government has developed a suite of policies for complementing markets in the commercialisation of scientific research and innovation. These include:

- **Increased support for the early stages of innovation.** Budget 2009 allocated £405 million of additional funding to support low carbon industries and advanced green manufacturing. It also announced a further £50 million in funding for the Technology Strategy Board, to increase its capacity to support innovation in areas such as low carbon vehicles and buildings which have high potential to drive future growth, and £90 million to fund detailed design and development work (FEED studies) for the carbon capture and storage demonstration competition.
- **Closing the financing gap for growing low carbon companies.** The Government has created the UK Innovation Investment Fund to address the finance gap which occurs before new technologies reach the marketplace, where companies have invested in research and development but where new revenue streams have yet to begin to be generated by sales. The Fund will invest in technology-based businesses with high growth potential, including in the low carbon area, that require equity finance. It will focus on investing in growing businesses. The Government will invest £150 million to cornerstone the Fund and leverage additional private sector investment. It is the Government's ambition to build this into a fund of up to £1 billion over the

next 10 years. The Government is also working to bring together investors, innovators and policy officials in a three-way symposium to be held in the autumn.

- **Greater co-ordination on low carbon innovation.** The Government will ensure that public sector support for low carbon innovation is coordinated and that these investments create critical mass and coherence so that UK business has greater clarity and is better able to access the most relevant support available. This will include expansion of the Low Carbon Innovation Group – a strategic collaboration between key organisations delivering this support.

A low carbon transition for the whole economy

xxiii The economic opportunities and threats arising from the shift to low carbon extend across the entire British economy. This strategy therefore addresses not only the specific needs of business catering to the growing market for low carbon goods and services, but the wider actions that Government is taking to ease Britain's transition to a low carbon economy. These include:

- **Measures to encourage organisations to take advantage of greater resource efficiency and energy savings**, including an additional £100 million in Budget 2009 for interest free loans to businesses investing in greater energy or resource efficiency;
- **Facilitating the low carbon transition through a transformation of Britain's infrastructure**, including investment in the refurbishment of the UK's energy infrastructure to handle renewable technologies, including micro-generation;
- **Equipping the British workforce with the skills that will allow them to seize the opportunities of the low carbon economy**, including the development of a new skills strategy that will address the UK's low carbon skills needs;
- **Driving demand for low carbon products through procurement and by providing consumers with information and incentives to encourage them to choose lower carbon options**. This includes the use of tools such as 'Forward Commitment Procurement'; the development of standards, such as PAS 2050; and the introduction of consumer incentives, such as the £230 million of support for consumers purchasing low carbon vehicles from 2011;
- **Creating a climate resilient economy**. This includes activities to understand and increase awareness of the inevitable changes in climate such as the Climate Change Projections.

xxiv Later this year, the Government will be launching a campaign to help SMEs better understand and respond to the opportunities and risks posed by the move to the low carbon economy.

A just transition

xxv As with previous structural changes to the economy, the move to a low carbon economy will affect each business, worker and family differently. This will depend on the sector a person works in, the type of job they are doing and where they are geographically located. Previous economic structural shifts have had huge social impacts, with some workers and communities being left behind as industries are restructured by change.

xxvi Equipping Britain to take advantage of the move to low carbon is a social obligation as well as an economic imperative. It requires policies that enable people to respond to industrial change positively, through the acquisition of new skills and access to new opportunities and new jobs.

xxvii The Government is committed to doing all it can to ensure this just transition. For this reason, the Government will create a forum for considering these issues and advising government. The new Forum for a Just Transition will include representatives from Central Government, national, local and regional bodies, Trade Unions, business organisations, and third sector bodies.

Introduction:

Why a low carbon industrial strategy?

1 To meet Britain's climate change targets – to reduce greenhouse gas emissions by at least 80% below 1990 levels by 2050 – each unit of economic output in Britain will need to be produced using on average one tenth of the carbon dioxide emitted today. This simple but compelling fact is going to transform our whole economy. It will change our industrial landscape, the supply chains of our businesses and the way we all live and work. The vast majority of, if not all, economic activity in Britain will have to reduce its carbon impact.

2 It will be a global transition. Governments from across the world are now putting in place policies that will reduce greenhouse gas emissions across their economies, creating a greener global economy, and an entire economic sector driven by the demand for low carbon goods and services.

3 This essential transition will likely bring costs but also substantial economic benefits for Britain. The core objective of this strategy is to ensure that British businesses and workers are equipped to maximise the economic opportunities and minimise the costs. They will do this both by catering to growing global markets for low carbon goods and services and also by using greater resource efficiency to lower input and waste costs. This strategy sets out both the scale of these potential opportunities and a programme of Government action for assisting British based firms to seize them.

4 Central to the opportunities that come with the transition to a low carbon economy is the capacity of British firms to competitively supply growing global markets. Independent research suggests that the low carbon and environmental goods and services (LCEGS) sector and its supply chain already provides over 880,000 jobs in the UK and forecasts that this could increase by up to 400,000 by

2015[7]. This strategy sets out how Britain can transform these existing strengths into durable competitive advantages for the future.

5 Private enterprise and public policy will both play an important part in building these strengths in Britain. The low carbon economy will be driven and shaped by the choices of consumers and the strategies of businesses. But government – both domestically and through the EU – will have influence over many of the things that will shape this market: from the policies that affect the price of carbon to those that encourage or enable the long-term investments that are required for new green technologies or low carbon goods and services.

Box A – Commission on Environmental Markets and Economic Performance

In 2006 the Commission on Environmental Markets and Economic Performance (CEMEP) was established by the Government in the light of the Stern Review on the Economics of Climate Change.

In November 2007, the Commission published a report[8], setting out recommendations for government, businesses and others to drive investment and innovation in environmental markets in Britain, and in so doing seize substantial opportunities for wealth and job creation. The recommendations for government policy focused on three main areas:

- **Environmental policy.** To provide the appropriate signals to the economy through measures such as putting a credible long-term price on carbon, better environmental regulations and removing barriers to commercialisation.
- **Innovation policy: market 'pull'**. Market 'pull' instruments to support the larger scale deployment of emerging innovations by helping to create 'lead markets', which – in the environmental field – do not generally exist in the absence of policy intervention.
- **Innovation policy: supply 'push'**. Policies underpinned by effective investment in the technologies and skills that will help develop competencies in Britain, and around which the new industries of the future will emerge.

This strategy builds upon the Government's response to the report, published in May 2008[9], developing further the policy landscape around these areas.

6 It is vital that government provides the clarity and commitment that enables the private sector to invest confidently in low carbon change, and helps consumers to make low carbon choices.

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[7] Innovas (2009) Low Carbon and Environmental Goods and Services: an industry analysis, www.berr.gov.uk/files/file50253.pdf

[8] BERR, Defra and DIUS (2007) Commission on Environmental Markets and Economic Performance, www.defra.gov.uk/environment/business/innovation/commission/pdf/cemep-report.pdf

[9] HMG (2008) Building a low carbon economy: unlocking innovation and skills, www.defra.gov.uk/environment/business/innovation/commission/pdf/cemep-response.pdf

7 The specialist skills, new infrastructure and support for innovation that will make Britain one of the best places in the world to start and build low carbon businesses require a combination of dynamic market forces and strategic action and investment by government. This strategy identifies areas where market and other failures exist – and where there is therefore the strongest case for Government action.

8 In March 2009 the Government set out a vision for a low carbon industrial strategy that targeted four key areas[10]:

- Energy efficiency to save businesses, consumers and the taxpayer money;
- Energy infrastructure, focusing on the trinity of low carbon generation sources: renewables, nuclear power and clean coal, supported by a "smart" grid;
- Making Britain a global leader in the development and production of low carbon vehicles; and
- Making Britain the best place to locate and develop a low carbon business.

9 Since March, the Government has built on this vision with clear and ambitious investment and policy plans in all of these areas[11]. These have included:

- **Energy efficiency.** Budget 2009[12] allocated £375 million to help households, businesses and the taxpayer save money through resource efficiency. This included £100 million to increase the availability of interest-free loans to SMEs for the purchase of energy saving equipment; and £65 million to increase the availability of similar loans to the public sector.
- **Energy infrastructure.** Budget 2009 allocated £90 million to fund engineering and design studies for carbon capture and storage (CCS). The Government has also launched ambitious policy proposals in this area[13].
- **Low carbon vehicles.** In April, the Government published a clear strategy for how Britain will target direct investment of over £400 million to realise its ambition of being at the forefront of ultra-low carbon vehicle development, demonstration, manufacture and use[14]; and at Budget 2009, the regulatory framework for transport was further tailored to encourage the demand for low carbon vehicles by lowering the carbon threshold for company car tax.
- **Making Britain the best place to locate and develop low carbon business.** Budget 2009 announced £405 million to help establish Britain as a market leader in low carbon industries and advanced green manufacturing. This will support industrial and technological opportunities, including in wind, marine and nuclear energy, and will help attract and protect investment in Britain's low

[10] HMG (2009) Low Carbon Industrial Strategy: A Vision, www.berr.gov.uk/files/file50373.pdf

[11] HMG (2009) Investing in a Low Carbon Britain, www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/lc_uk.aspx

[12] HMT (2009) Budget 2009: Building Britain's Future, www.hm-treasury.gov.uk/bud_bud09_repindex.htm

[13] DECC (2009) Towards Carbon Capture and Storage: Government Response to Consultation, www.berr.gov.uk/files/file51115.pdf

[14] HMG (2009) Ultra-Low Carbon Vehicles in the UK, www.berr.gov.uk/files/file51017.pdf

carbon supply chain. Budget 2009 also allocated a further £50 million to the Technology Strategy Board, enabling it to increase its support for business innovation in areas of high growth potential including low carbon technologies and high value manufacturing.

10 This document develops and brings together these strands of work into a single strategy for seizing the industrial benefits of the transition to low carbon in Britain in the years ahead.

11 Part 1 focuses on key areas of low carbon opportunity. It identifies a range of sectors in which the Government believes that market failures and other barriers are blocking the development of Britain's full potential to exploit sustainable economic opportunity in low carbon industry. It sets out the actions the Government will take or is already taking to address these.

12 Part 2 looks at these opportunities from a national, regional and local perspective, asking how public policy can encourage areas of low carbon industrial excellence in specific parts of the UK to maximise economic value. These commitments include launching the first Low Carbon Economic Area, located in the South West, to reflect its strength in the marine energy sector.

13 Part 3 focuses on growing innovative low carbon businesses in Britain. It sets out how the Government is helping to make Britain the best place in the world to grow businesses developing new low carbon goods and services. Because innovation will be critical to the low carbon transition, the Government has developed a suite of policies to complement markets and address market failures to catalyse business innovation and capitalise on growth opportunities.

14 Part 4 looks at the challenges of building a wider low carbon economy. It sets out what the transformation to low carbon means for the economy as a whole, and how the Government is helping to ease the transition. This includes action that will help businesses, government and consumers save money through energy and resource efficiency and offer substantial opportunities, for example in energy efficient goods, and energy and carbon management services. Part 4 also sets out action and investments to transform Britain's infrastructure and to equip our workforce with the required skills to enable the move to a low carbon economy. It shows how the Government can help drive the demand for low carbon products through the way it regulates and procures goods and services. It responds to the complex challenge of ensuring that Britain's economy is resilient to the inevitable changes in the climate and that the transition to low carbon is socially just and fair, given the disruption it could bring to many established industries and methods of production.

Box B – Opportunities and risks for businesses from the transition

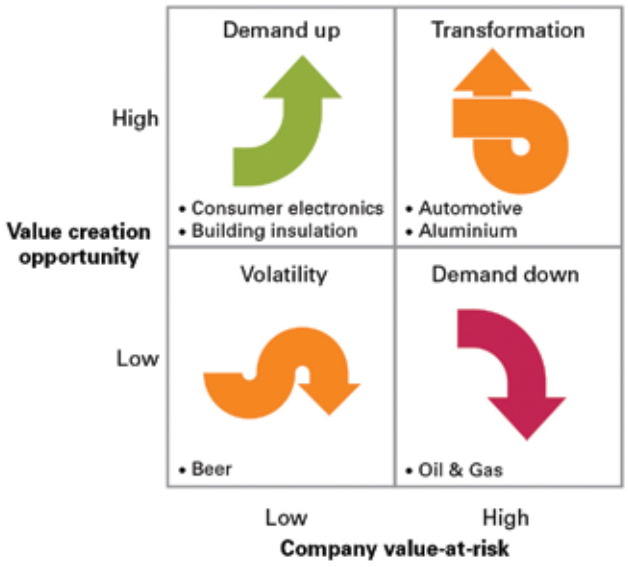
The economic opportunities arising from the shift to low carbon, and the implications for business models, extend across the entire British economy. Analysis by Ernst & Young[15] concluded that a green economy will be one in which 'lower carbon and resource efficiency will permeate all products and services throughout the entire economy'.

The Carbon Trust report *Climate change – a business revolution?*[16] shows how tackling climate change can create opportunities for a company to increase its value by up to 80% if it is well positioned and proactive. Conversely, it could threaten up to 65% of value if the company is poorly positioned or a laggard.

The opportunities and risks are driven by shifts in consumer behaviour, technology innovation and regulation. Targeted regulation is usually the key initiator of change, although the cost of carbon is not the decisive factor in many sectors.

The report shows how the impact of tackling climate change will vary by sector and identifies four ways in which value could be created or destroyed: sector transformation, upward demand shift, downward demand shift and increased volatility – see Chart 1.

Chart 1: How climate change could create or destroy company value



Source: Carbon Trust and McKinsey & Co analysis

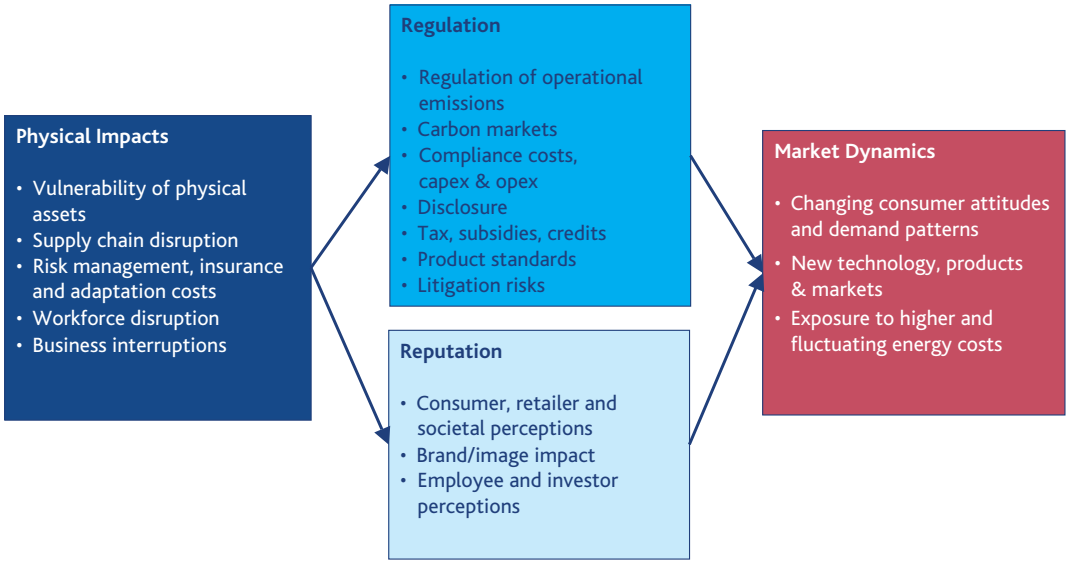
[15] Ernst & Young (2008) Comparative advantage and green business, www.berr.gov.uk/files/file46793.pdf

[16] Carbon Trust (2008) Climate Change: a business revolution?, www.carbontrust.co.uk/publications/publicationdetail.htm?productid=CTC746

The actual resulting shifts to a company's value will depend not only on the sector exposure, but also on the individual company's response.

Preparing for, and addressing, the business risks and opportunities around climate change is one of the greatest challenges any organisation will face in the near future. The risks and opportunities can range from those posed by the inevitable change in the climate, to changes driven by regulation or changing consumer behaviour. These are illustrated in chart 2.

Chart 2: Climate change related opportunities and threats



Source: Carbon Trust

Those businesses that best prepare for and address these risks will be those that succeed in the low carbon economy.

Through this strategy, and work building from it, the Government aims to give businesses a better understanding of what this transition will mean across the British economy and hence to enable businesses to better prepare for this shift.

15 A low carbon resource efficient economy must be built on a new political and economic consensus on the necessity for radical change. Driving that change quickly and effectively, and ensuring that we make the most of its potential benefits for innovation, growth and job creation in Britain will require both the massive dynamism of the private sector and a strategic role for government. This strategy sets out what that means.

Part 1:

The low carbon opportunity

Britain's strengths in a global low carbon market

1.1 Independent research estimates that the global market for low carbon and environmental goods and services (LCEGS) was already worth £3 trillion in 2007/08, and could grow to an estimated £4.3 trillion by 2015[17]. This growth could be further accelerated by the agreement at April's G20 Summit in London that one of the goals of fiscal expansion should be to accelerate the transition to a green economy as well as the potential global deal at the UN negotiations in Copenhagen this December.

1.2 A number of studies have examined the scale of the low carbon economy in Britain and our areas of national strength. An intensive analysis of the sector estimated that the LCEGS market was worth £106 billion to the UK in 2007/08 and employed around 880,000 people directly and through the supply chain. This places the UK as the sixth largest low carbon and environmental economy in the world, with 3.5% of global market share. It is estimated that over 1 million people could be employed in the LCEGS sector by the middle of the next decade.

1.3 The UK LCEGS sector is expected to grow by over 4% per annum up to 2014/15. It is one of the few sectors of the economy expected to maintain positive growth rates through the downturn.

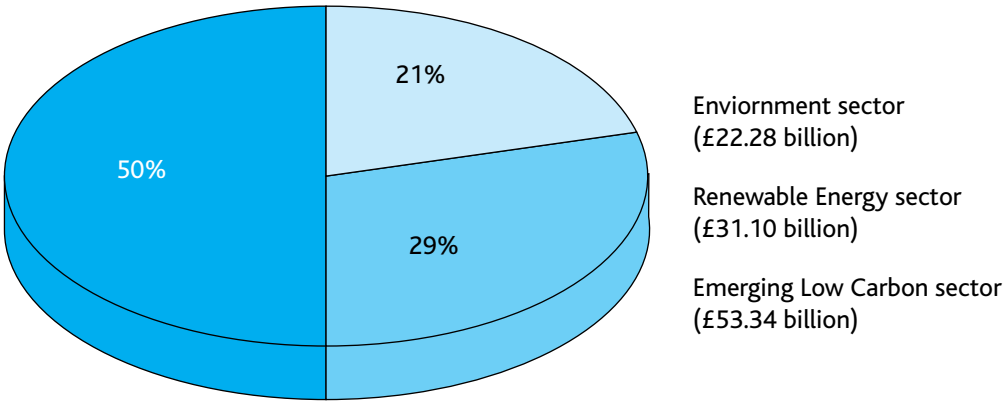
1.4 These strengths are already driving good export performance. Britain is a net exporter of goods and services in the LCEGS sector, with exports exceeding imports by about £4.4 billion in 2007/8. Exports represent about 10% of UK LCEGS market value.

[17] Innovas (2009) – Source for figures in the following four paragraphs.

1.5 The LCEGS sector can be broken down into three key areas of economic activity:

- **Environmental sector**, including energy, carbon and broader environmental consultancy, air pollution control, environmental monitoring, marine pollution control, waste management, recovery and recycling; as well as the service industries that support environmental management.
- **Renewable energy sector**, including wind, wave and tidal, biomass, geothermal, hydro and photovoltaic energy generation and the services that support them, including renewables consultancy.
- **Emerging low carbon sector**, including alternative fuels such as nuclear, and alternative fuels for vehicles, carbon capture and storage, building technologies, energy management and carbon finance. A breakdown of the market value for the UK into these three sub sectors is shown in **Figure 1** below.

Figure 1 – The Low Carbon and Environmental Goods and Services Sector[18]



1.6 There have been multiple studies[19] assessing Britain's opportunities in the move to a low carbon economy. These have considered our potential to gain value from expanding markets that are being shaped by policies to mitigate and adapt to climate change and to increase energy security. The assessments have taken into account areas of existing comparative advantage, technological strengths and natural resources.

1.7 This strategy has used these analyses to identify the areas of greatest economic opportunity for Britain in the transition to a low carbon economy, based on the evidence currently available. These focus on the low carbon energy, transport, buildings and industrial markets. They comprise a balance of opportunities that exist now, or over the next few years, such as offshore wind; and areas where we can start to lay the key foundations now, but where the value may not materialise until later, such as wave and tidal energy.

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[18] Innovas (2009)

[19] These include: Ernst & Young (2008) Comparative advantage and green business; Innovas (2009); Carbon Trust (2009) Focus for success: A new approach to commercialising low carbon technologies; EEF (2008) Delivering the Low Carbon Economy; CBI (2007) Climate Change: Everyone's Business; the Climate Group (2007) In the Black: The Growth of the Low Carbon Economy; BIS (2009) Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy.

1.8 Within these sectors, we have developed a picture of where market conditions are allowing British firms to exploit durable competitive potential and where, conversely, barriers to market or market failures may be preventing this. As the analysis makes clear, the intention is not to support particular technologies on principle, but to target specific areas where proportionate government intervention can bring positive net benefits and unlock long-term competitive potential for British based firms.

Offshore wind power

The opportunity in offshore wind

1.9 Offshore wind is a rapidly growing sector across Northern Europe and will play an important part in meeting Britain's renewable energy and carbon emission reduction targets as well as improving energy security by 2020 and beyond. It has the potential to employ a further 40,000-70,000 workers by 2020, bringing annual economic benefits and investment to Britain of £6-8 billion[20].

1.10 With tens of thousands of miles of coastline, shallow waters and high average wind speeds, Britain is, and will remain for the foreseeable future, the largest single market for offshore wind in the world. The Government has recently completed a Strategic Environmental Assessment (SEA)[21] on UK offshore energy, which concluded that there is the potential for some 25 GW of additional offshore wind generating capacity in English and Welsh territorial waters and the UK Renewable Energy Zone (REZ), up to 60m depth, by 2020. Similar exercises are underway for Scottish and Northern Irish waters, with a total potential of over 39 GW across UK waters.

1.11 In June, the Government announced that the scale of development considered under the SEA would be permissible without causing unacceptable environmental impacts at a strategic level[22]. The Crown Estate, the leasing authority for offshore wind developments, is now proceeding with its Round 3 leasing competition, which it intends to complete by the end of 2009. This is an important signal to investors that Britain is committed to large scale offshore wind generation.

Challenges and barriers to market in offshore wind

1.12 Despite this large market for offshore wind energy generation and growing global demand for this technology, Britain's supply chain is still developing. Countries such as Denmark and Germany have a far more developed onshore wind sector and are investing in the development of the offshore wind industry.

1.13 Whilst Britain is well placed to take advantage of opportunities in offshore wind, a number of barriers exist for firms wishing to manufacture and export offshore wind components or play a part in the domestic offshore wind supply chain. These include some of the typical ones seen in emerging low carbon technologies, such

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[20] Carbon Trust (2008) Offshore Wind Power: big challenge, big opportunity

[21] www.offshore-sea.org.uk/site/index.php

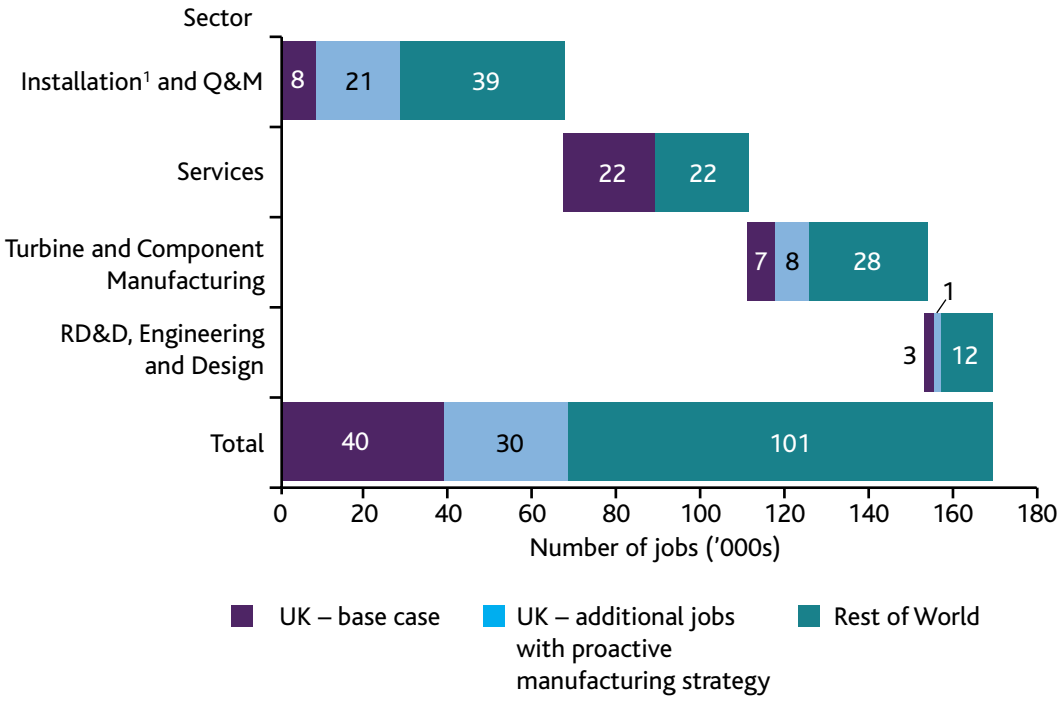
[22] DECC (2009) A Prevailing Wind: Advancing UK Offshore Wind Deployment, www.berr.gov.uk/files/file51989.pdf

as a tendency for the private sector to underinvest in research and development due to issues such as knowledge spillovers and information failures. This can be, for example, because the rewards of their investment can spillover to other firms, such as when workers change companies, or because of uncertainty over how successful the investment may be.

1.14 There are also challenges more particular to the offshore wind sector. The high initial costs of entering this market create an unattractive risk/return profile, making it difficult for manufacturers to justify investment, especially in the current economic climate. The Government also recognises the need to streamline the planning process and ensure timely grid connections for wind deployment.

1.15 Even if these issues are resolved, enabling Britain to meet its aspirations for offshore wind deployment, there are further challenges to be overcome if Britain is to maximise its economic benefit. The most important of these will be to attract major turbine manufacturers to base their operations in Britain, unlocking further development of the related supply chain. This could be expected to generate around 30,000 jobs directly and in the supply chain (illustrated in Figure 2), and £2 billion of annual revenues[23]. This could make the difference between a positive and negative net economic impact to Britain from offshore wind deployment to 2050 as it displaces other forms of energy generation.

Figure 2 – Number of UK jobs created by offshore wind by 2020[24]



1 Includes indirect jobs related to the installation and construction of turbines, foundations, substations and grid connections
Source: BCG analysis

[23] Carbon Trust (2008) Offshore Wind Power: big challenge, big opportunity

[24] Carbon Trust (2008) BCG analysis

Addressing the barriers to market in offshore wind power

1.16 The Government has already taken significant steps towards tackling the challenges around the creation of a large attractive market for offshore wind energy generation, including a substantial British based supply chain. The Government has provided a strong long-term policy framework, signalling to investors that it is committed to the technology and providing confidence to manufacturers seeking to invest in the sector.

1.17 The proposed increase in the Renewables Obligation support for offshore wind announced in Budget 2009, which is subject to the outcome of the review, consultation and Parliamentary approval, would represent an injection of around £2-3 billion of support to help improve the profitability of many projects. This would safeguard up to 3 GW of planned investment over the next two years by increasing investor confidence in returns. An early sign of increased willingness to invest in the sector was shown by the announcement that the 630 MW London Array offshore wind farm would proceed and the decision by DONG Energy to go ahead with its 367 MW Walney offshore wind farm.

Box C – Renewables Obligation

The Renewables Obligation (RO) is the Government's main mechanism for supporting the generation of renewable electricity. It works by placing an obligation on licensed UK suppliers of electricity to source a specific and annually increasing percentage of their electricity sales from eligible renewable sources, or pay a penalty.

Generators are issued with Renewables Obligation Certificates (ROCs) for every megawatt hour (MWh) of eligible generation. These can be sold between suppliers and are used to demonstrate compliance with the obligation.

The introduction of 'banding' to the RO on 1 April 2009 means that different renewable generating technologies now receive different numbers of ROCs/MWh.

Since its introduction in England, Wales and Scotland in 2002, the RO has been successful in stimulating growth in renewable electricity generation, which has more than doubled since 2002, and has a strong project pipeline across Britain. The RO was introduced in Northern Ireland in 2005.

As part of Budget 2009, the Chancellor announced that the Government will be reviewing the level of ROC support for offshore wind.

1.18 Britain has recently introduced a package of measures that, taken together, will remove or significantly reduce barriers to grid access for renewable generation, as part of the Transmission Access Review. These include the announcement last month of the commencement of a new offshore transmission regulatory regime to connect the potential 39 GW of offshore wind in UK waters in the most cost effective and efficient way.

1.19 The Government is also committed to an ambitious planning reform agenda, in particular of the statutory planning system. Improvements to the system are already being made with provisions in the Planning Act 2008, which creates a new system of development consent for nationally significant infrastructure projects, including large wind farms, in England and Wales (over 100 MW offshore or 50 MW onshore) and significant harbour-related development. Scotland is implementing similar reforms to streamline its planning system. In addition, *The UK Renewable Energy Strategy*[25], published today, sets out reforms to the Town and Country Planning system which are designed to deliver a more effective, transparent and responsive system in England. It also includes a package of measures designed to support more effective and proactive planning by local and regional authorities so that they are better able to capitalise on the renewable opportunities available to them.

1.20 The Government has also been in discussion with The Crown Estate, the landowner of Britain's offshore territories, on how it can support innovation in developing offshore wind. The Crown Estate has already made direct investments to promote the technology and is actively seeking further opportunities to encourage the development of a British based supply chain for the offshore wind generation sector.

1.21 **In addition, Government has earmarked up to £120 million to support a step-change in investment in the development of the offshore wind industry in the UK. This includes funding for new offshore wind energy manufacturing facilities in the UK; investment in the development of next-generation and near-market offshore wind technologies through large scale demonstration; and improving the UK's capability in integrated offshore wind testing, including through dedicated testing facilities. Further details are set out in *The UK Renewable Energy Strategy*, including the formal establishment of the Office for Renewable Energy Deployment (ORED), part of DECC, to help deliver this support.**

Wave and tidal power

The opportunity in wave and tidal power

1.22 Britain's long oceanic coastline and river and estuarine resources will provide scope for marine energy to contribute significantly to our renewable energy mix. They also represent a significant economic opportunity for Britain.

1.23 It is estimated that the global wave and tidal market was worth £1.98 billion in 2007/08, of which 3.7% (£73 million) was attributed to the value of the British wave and tidal market. About 38% of the UK's market value came from manufacturing activities and about 10% came from exports[26].

1.24 There are two key groups of wave and tidal power technologies: tidal range, and wave and tidal stream.

[25] HMG (2009) The UK Renewable Energy Strategy, www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

[26] Innovas (2009)

Tidal range

1.25 Tidal range generation is a mature and proven technology. Although there are no tidal range power schemes currently in operation, several major projects are under consideration, principally in the Severn and Mersey.

1.26 According to the Sustainable Development Commission[27], tidal range generation could contribute around 13% of Britain's electricity supply. The largest resource is concentrated in the Severn. The Government is currently conducting a two-year study, due to report in 2010, to assess the feasibility of different options for tidal barrages and lagoons.

Wave and tidal stream

1.27 The wave and tidal stream sector is still at an early stage of development – around the level where wind was some 15 years ago. Only two fully commercial-scale devices have been deployed to date – one wave and one tidal stream[28] – although other devices in the half megawatt range are scheduled for deployment at the European Marine Energy Centre (EMEC) in Scotland later this year. Commercial demonstrators are also proposed off the Welsh coast.

1.28 The Carbon Trust estimates that Britain has a practically attainable wave resource of around 50 TWh of electricity a year and a practical tidal stream resource of around 18 TWh/year 26. This equates to around 50% of Europe's practical tidal energy resource, 10-15% of global tidal resource and 35% of Europe's wave energy resource. The Carbon Trust estimates that wave and tidal stream energy could supply up to 20% of the current British electricity demand and that this translates into a potential of approximately 16,000 jobs in Britain, around a quarter of which would support British exports[29]. Independent growth forecasts undertaken earlier this year suggest that the sector could grow by over 5% annually up to 2015[30], when it would be expected to enter an early mass deployment phase.

1.29 This wealth of resource and potential has helped to make Britain a focus for activity in the wave and tidal sectors. The £72 million of British investment in the sector during 2004-08 accounted for about half the global investment in wave technology development, and a quarter of all wave developers worldwide have offices or facilities in Britain.

1.30 Britain has strengths across the whole supply chain. It is developing a strong manufacturing base in the marine sector, and has transferable skills and experience from other industries, such as the maintenance of oil and gas facilities in the North Sea. There are currently nearly eighty wave and tidal energy devices under development[31]. The devices that are closest to market are British based

[27] Sustainable Development Commission (2007) Turning the Tide: Tidal Power in the UK, www.sd-commission.org.uk/publications/downloads/Tidal_Power_in_the_UK_Oct07.pdf

[28] A 2.25 MW Pelamis three device array deployed in Portugal in September 2008 and a 1.2 MW Marine Current Turbines SeaGen device was deployed in Strangford Lough near Belfast in May 2008

[29] Carbon Trust (2006) Future Marine Energy

[30] Carbon Trust (2009) Focus for success: A new approach to commercialising low carbon technologies

[31] Carbon Trust

developments, providing Britain with early mover advantage. This advantage is further strengthened by the UK's expertise in engineering consultancy and a strong academic base – 24 universities have some focus on the marine sector.

1.31 Britain also has some of the world's most advanced facilities for the testing of innovative marine technologies at the New and Renewable Energy Centre (NaREC) in Northumberland and at EMEC in Scotland. These facilities in particular have acted as a catalyst for sector activity and have helped to encourage overseas companies to become active in Britain. For example, in the last year, the Norwegian tidal developer, Hammerfest Strom, has set up a British subsidiary to exploit its prototype tidal turbine and the Norwegian based company Fred Olsen Renewables has announced its intention to relocate its wave energy research, development and manufacturing subsidiary to Britain.

Challenges and barriers to market in wave and tidal power

1.32 A key barrier in the wave and tidal stream sector is the cost of testing and demonstrating devices in real marine conditions, especially as the bulk of companies in the sector are SMEs. With the wave and tidal sector at an early stage of development, the cost of technological innovation remains high. Returns on investments are only possible over long timeframes, and with a relatively high risk profile, it is difficult for innovators to gain access to finance.

1.33 By 2012, industry forecasts suggest the wave and tidal stream industry will need further support to increase the scale of demonstration and testing from demonstration stage (c.1-5 MW) to large arrays (c. 5-30 MW).

1.34 For the tidal range sector, a key barrier is the capital cost of development. This results in relatively high unit costs of energy during 35-40 year financing periods, though the lifetime of these schemes is estimated to be around 120 years.

Addressing barriers to market in wave and tidal power

1.35 Government support through the Technology Strategy Board and Research Councils has been instrumental in addressing some of the market failures associated with research and development of wave and tidal stream technologies. In addition, the Government has established the Energy Technologies Institute (ETI) as a unique private/public partnership to invest in the development of low carbon energy technologies and solutions. Marine energy projects have been among their first funding announcements. The Environmental Transformation Fund also includes a wave and tidal programme – the Marine Renewables Deployment Fund (MRDF) – which, alongside programmes in devolved administrations, will support the first commercial demonstration programmes in Britain.

1.36 The Government is already addressing the high costs of commercial deployment of wave and tidal devices through the Renewables Obligation, under which energy generated by these devices now receives an enhanced level of support. A dedicated revenue support scheme may also be needed for larger schemes. This is under consideration through the tidal power feasibility study.

1.37 **To address the barriers around pre-commercial demonstration, the Government is supporting Wave Hub – the development of a significant demonstration and testing facility off the Cornish coast – with up to £9.5 million of investment from the funding announced at Budget 2009. This will complement the facilities at NaREC and EMEC and further develop Britain's lead in the sector.**

1.38 **With Wave Hub as a catalyst, the South West will become Britain's first Low Carbon Economic Area, focusing on the development of marine energy demonstration, servicing and manufacture. Using a combination of public and private funding, the area will capitalise on the region's significant potential for wave and tidal energy deployment, research, demonstration and engineering. This total investment of around £100 million, of which up to a further £10 million on top of the Wave Hub funding will come from central Government, will consolidate Britain's position as the global lead in wave and tidal technologies.**

1.39 **The Government is also proposing to invest up to £10 million at NaREC to build on and utilise existing infrastructure at the centre to provide testing facilities for marine drive systems and other critical wave and tidal energy device components. This would provide an open access facility for marine developers to test and prove designs and components onshore – improving their efficiency and reliability – before committing to costly and high risk testing and demonstration at sea. In addition, the Government is planning to invest up to £8 million in expanding the later stage testing facilities at EMEC.**

1.40 **To further support the testing and demonstration of pre-commercial wave and tidal devices the Government will launch a Marine Renewables Proving Fund which will provide up to £22 million of grant funding. This will accelerate wave and tidal technologies' move towards commercial demonstration and assist the development of successful projects under the Marine Renewable Deployment Fund.**

1.41 The proposed investments at NaREC and EMEC alongside the investment at Wave Hub and through the Proving Fund will provide Britain with an unparalleled marine energy testing, development and demonstration infrastructure. They will reduce both the technical and financial risks associated with the development of these technologies, accelerating the sector's development and attracting overseas investors, thus cementing Britain's position as a global leader in the sector. Further details on the role of marine energy in delivering the UK's renewable energy targets are set out in *The UK Renewable Energy Strategy*[32].

[32] HMG (2009) The UK Renewable Energy Strategy, www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

Civil Nuclear Power

The opportunity in civil nuclear power

1.42 *The UK Low Carbon Transition Plan*[33], published today, explains that in order to decarbonise, our electricity supply will need to come from a mix including renewable sources, nuclear power and fossil fuels with carbon capture and storage. The draft National Policy Statement (NPS) for nuclear power, which the Government will be publishing for public consultation and Parliamentary scrutiny later this year, will set out in more detail why we consider there is an early need for nuclear power as part of this mix.

1.43 As set out in the White Paper on Nuclear Power[34], it will be for energy companies to fund, develop and build new nuclear power stations in Britain, including meeting the full costs of decommissioning and their full share of waste management and disposal costs. However, the Government has a strategic role in removing unnecessary obstacles to the development of new nuclear power stations.

1.44 Our ambition is for British based businesses to be an integral part of the domestic civil nuclear supply chain for both existing and any new nuclear power stations in Britain and to be in a position to compete in the rapidly expanding global market for civil nuclear power.

1.45 The civil nuclear sector is a global industry with a global supply chain. According to the World Nuclear Association (WNA), nuclear energy currently provides approximately 15% of the world's electricity[35].

1.46 A recent assessment by Rolls-Royce estimated that the global civil nuclear market is currently worth around £30 billion a year and by 2023 could be worth around £50 billion a year. Of this, approximately £20 billion is estimated to be from new build, £13 billion in support to existing nuclear plants, and £17 billion for new reactors[36].

1.47 There are currently around 440 nuclear plants, across 30 countries, with a total capacity of over 370 GW. The Nuclear Energy Agency has estimated that as many as 12 nuclear reactors will be constructed per year between 2007-2030 and that between 2030-2050 this will rise to 23-54 reactors a year.

1.48 The sector in Britain will undergo a period of revival in the coming years. Many of Britain's current nuclear plants are reaching the end of their lives and are soon due to be decommissioned. Although it may be possible to extend the lives of some of the current fleet, all but one of our plants (the Pressurized Water reactor at Sizewell B) is scheduled to be retired by 2023. This has major implications for the scale of investment required in energy generation in Britain.

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[33] www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

[34] BERR (2008) Meeting the Energy Challenge: a White Paper on Nuclear Power, www.berr.gov.uk/files/file43006.pdf

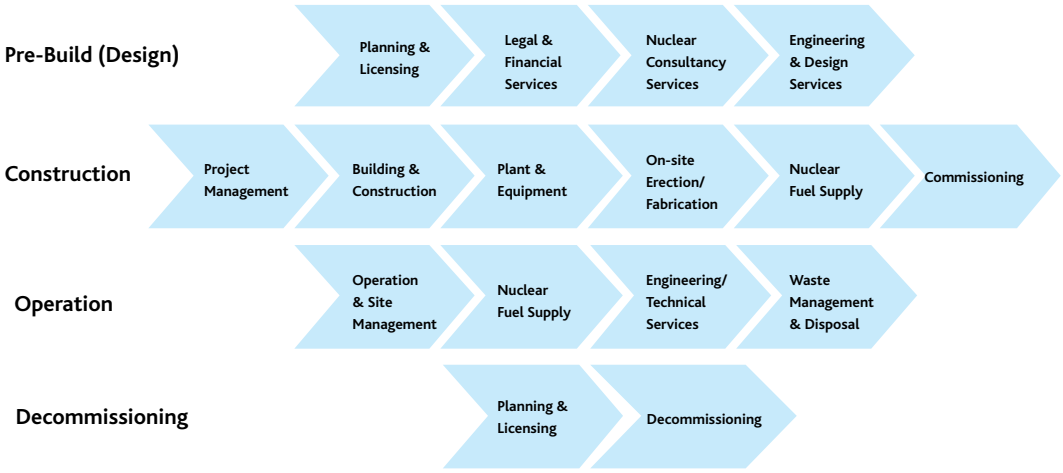
[35] World Nuclear Association www.world-nuclear.org/info/reactors.html (updated 1st May 2009)

[36] NAMTEC (2009) The Supply Chain for a UK Nuclear New Build Programme, www.berr.gov.uk/files/file47664.pdf

1.49 Whilst it is for energy companies to invest in new nuclear power stations, Government will do what is appropriate to facilitate this investment. There is no limit on the number of new nuclear power stations that may emerge in the UK over the next ten to fifteen years and beyond. However, if the current capacity of nuclear in the energy mix is to be maintained in 2025 there will need to be just over 9 GW of nuclear power capacity added, which could mean between 6 and 8 nuclear reactors built in the UK, representing a market of approximately £21 billion in the next decade, according to the Office for Nuclear Development (OND). This has been supported by public statements from utility companies likely to be leading the initial wave of nuclear new build, who have said that they have plans to build at least 12.4 GW of new nuclear power in the UK, equating to between 8 and 10 reactors, representing a market of approximately £24-£30 billion.

1.50 The supply chain (**Figure 3**) required to support such a new build programme both domestically and globally offers considerable opportunities for British based firms capable of producing the array of complex components required. Opportunities range from the manufacture of major key components through to smaller sub-components, site installation, maintenance, servicing, design and engineering consultancy, legal, financial and other services together with decommissioning.

Figure 3 – Elements of the nuclear new build supply chain[37]



1.51 Britain is well positioned to seize these opportunities, with companies operating here having been active in the development of civil nuclear power in the past. Britain still maintains capability in areas of manufacturing, construction plant operation and maintenance, decommissioning and nuclear waste management. British contractors, manufacturers and engineers have also gained extensive experience from the building, operation, maintenance and upgrading of nuclear plant and facilities in Britain and abroad. In addition, Britain has expertise in the decommissioning of nuclear power reactors, with a large highly-skilled workforce employed in operating and decommissioning reactors in Britain and in overseas projects (**Figure 4**).

[37] NAMTEC (2009)

Figure 4 – UK strengths across the civil nuclear supply chain

Stage	Process/Industry	UK Strength	UK Capability
Planning/Design/ Pre-Build	Legal and Financial Services	✓	
	Regulation/Planning/Licensing	✓	
	Design Services including Architecture and Engineering	✓	
	Project Management	✓	
Construction	Project Management	✓	
	Building and Construction		✓
	Nuclear Fuel Supply	✓	
	Non-Nuclear Island Components	✓	
	Nuclear Island Component Supply		✓
	On Site Installation		✓
Operation and Maintenance	Operation and Site management	✓	
	Nuclear Fuel Supply	✓	
	Safety Case/Health and Safety	✓	
	Engineering and Technical Services	✓	

1.52 Britain has a proven track record and a global reputation in project management and large scale engineering and infrastructure projects. It also has an advanced design, installation and manufacturing capability, together with world-renowned academic institutions at the leading edge of research and development.

1.53 Independent research suggests that in 2007/08 the civil nuclear manufacturing supply chain in Britain had a turnover of approximately £3.6 billion and employed over 33,000 people[38].

1.54 Historically, the export capacity of Britain's civil nuclear industry has been constrained by the use of unique 'one-off' plant models. However, new build in Britain is likely to use standardised Generation III+ reactor designs supplied by overseas reactor design companies. These are also likely to be commonly deployed in other global markets. This means that should British based supply chain companies succeed in becoming suppliers to the main reactor designers they will be better equipped to take advantage of the opportunities provided by the global markets for new nuclear build.

Challenges and barriers to market in civil nuclear power

1.55 Britain has a long heritage in nuclear power and should stand to be one of the major economic beneficiaries of future new nuclear build programmes. However, the long time lag since the last domestic nuclear plant was built poses some challenges to British based businesses looking to take advantage of global nuclear supply chain opportunities. Many companies have not maintained or developed their expertise as nuclear equipment suppliers.

[38] Innovas (2009)

1.56 Global demand is rising significantly with respect to the supply of a number of the larger components required in the building of a new nuclear plant. However, a recent report by the National Metals Technology Centre (NAMTEC)[39] suggests that there is a global constraint in the delivery of these components, and identified a number of pinch-points in the British supply chain related to global capacity, as in the case of ultra large forgings for the manufacture of the Nuclear Steam Supply System (NSSS) equipment and turbine generators and in the fabrication of NSSS equipment itself. This is likely to be due to the large capital investment costs required and the difficulty and time it takes to receive the right international accreditation to manufacture the components required for the nuclear industry. The Government is considering ways to resolve such bottlenecks and barriers to investment, working with trade associations, industry and other bodies.

1.57 A further potential barrier to the development of the nuclear supply chain is the supply of the skilled workforce required to manufacture, build, operate and maintain a new nuclear fleet. Findings from a recent study by the Nuclear Industry Association (NIA)[40] suggest that the British supply chain has a strong capability in most of the areas required to support a new nuclear build programme, with British industry potentially being able to supply approximately 70% of the total requirement of such a programme. However, the study further suggests that with some investment in facilities and in training new personnel, this could be increased to just over 80%. At present, much of this capability is employed in the support of existing nuclear power plants and new fuel cycle plants, and in decommissioning and waste management activities. In addition, some of this capability is currently employed in non-nuclear activities that require similar skills. This suggests it will be desirable to expand the pool of sufficiently skilled labour in Britain in this field to meet the growing global demand.

1.58 Many manufacturing firms, particularly SMEs, are not aware of the potential opportunities emerging in the civil nuclear sector. These need to be communicated to those previously engaged with the industry and potential new entrants.

1.59 Companies that work in the nuclear industry, including in the nuclear supply chain, must also adhere to the highest standards of quality and safety. Many technologies, components and services require high quality standards which can be complicated to understand and attain. Following the downturn in new nuclear build in the 1990s, many UK companies may have let accreditations lapse and have consequently lost experience in this sector.

1.60 These barriers point to the pressing need to re-invest in Britain's engineering and nuclear skills base and to ensure that British based firms understand both the opportunities and the requirements of supplying goods and services to the nuclear industry. Addressing these barriers will very likely require investment beyond that of any single company, and may require public investment, in partnership with leading companies.

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[39] NAMTEC (2009)

[40] NIA (2009) The UK Capability to Deliver a New Nuclear Build Programme, www.niauk.org/images/stories/pdfs/RationaleFullPaper.PDF

Box D – Recommendations from NAMTEC report *The Supply Chain for a British Nuclear New Build Programme*

The National Metals Technology Centre (NAMTEC) made a number of recommendations in its report to develop a British based supply chain for Britain's nuclear new build and global new build programmes. These were as follows:

- Supply chain development activities should be initiated to make potential supply chain companies aware of the opportunities of a nuclear new build programme, and help companies develop capability and capacity to relieve supply chain 'pinch-points'.
- Additional supply chain 'mapping' should be carried out, including to lower tiers of the supply chain, to understand where Britain has expertise and/or the potential to compete for British and overseas nuclear new build.
- To provide certainty to the nuclear industry and development of the supply chain, the Government's facilitative actions must remain on schedule to ensure that the indicative timelines presented in the Nuclear White Paper are met. Recruitment of the appropriate number of skilled inspectors will be important to ensure that the Generic Design Assessment (GDA) process runs to time.
- Targeted support should be provided to companies seeking nuclear accreditation and qualification. Companies seeking accreditation or to re-establish lapsed accreditations will need to commit considerable resources, both in terms of time and money, to secure nuclear qualification.
- Companies must have access to education and training programmes, and a supply of high quality graduates, which meet their needs in the development of a skilled workforce across all aspects of the nuclear supply chain, which will include the development of non-nuclear specific skills.

Addressing barriers to market in civil nuclear power

1.61 In order to deliver the vision of creating a strong, successful and profitable nuclear supply chain, supplying global markets and providing high value jobs and careers for people in Britain, the Government is taking a number of measures.

1.62 **The Government will provide capital investment of up to £15 million to establish a Nuclear Advanced Manufacturing Research Centre that combines the knowledge, practices and expertise of manufacturing companies with the capability of universities. This will complement the existing Advanced Manufacturing Centres in Sheffield and Glasgow and the Nuclear Laboratory in Sellafield. The centre will consist of a consortium of manufacturers from the UK nuclear supply chain and universities. The facility will enable around 30 companies to work together on the development of processes for the manufacture of nuclear components and assemblies, to develop management processes, training and workforce development programmes and to achieve civil nuclear standards and accreditation. The centre will also coordinate the acquisition of capability and the response to international markets.**

Rolls-Royce will take a leading role – bringing technical ability, commercial discipline and access to markets.

1.63 **The Government will strengthen the Manufacturing Advisory Service (MAS) to support potential British based suppliers for the civil nuclear industry. The MAS is a highly effective existing service that helps British based manufacturers maximise their capabilities. The companies which form a part of the Advanced Nuclear Manufacturing Research Centre will have access to informal expert advice from top tier companies and universities. However, there will be many other potential market entrants outside of this institution for whom entering this market may become a possibility if the entry barriers, particularly around understanding the quality assessment process, can be reduced. MAS will now provide this advice on a subsidised basis.**

1.64 **The Government and industry are undertaking a programme of nuclear supply chain promotional work with trade bodies involved in the nuclear industry, principally NIA and NAMTEC. The NIA is communicating supply chain opportunities and requirements, under the banner of SC@nuclear, through a series of regional and sub-sectoral supply chain conferences and seminars.**

1.65 To develop Britain's civil nuclear skills base, OND is working in partnership with the National Skills Academy for Nuclear, Cogent (the Sector Skills Council responsible for nuclear), the Department for Business, Innovation and Skills, the NDA, the Engineering Construction Industry Training Board (ECITB) and ConstructionSkills, the Sector Skills Council for construction, to develop a high-level new nuclear skills and capability plan. This will detail the volume of different skills and when they will be needed in order to be able to have new nuclear power plants built and generating by 2018. The study will look at all elements including the design, engineering, construction, commissioning, operation and maintenance of a plant, including the supply chain. This detail will enable interested parties to focus on any potential pinch-points and direct training resources. In addition to the above study, the OND is also working with Cogent to undertake a skills planning exercise which will estimate the nuclear skills requirements and current workforce numbers across all elements of the nuclear sector (new build, decommissioning, existing operation and military) over the next few decades.

1.66 The Engineering Construction Industry has an important role to play in building new nuclear power stations and other infrastructure needed for a low carbon economy. The Gibson Review, due to report in autumn 2009, is currently considering productivity and skills in the UK engineering construction sector and assessing what more might be done to enable the sector to seize the opportunities nuclear new build and other infrastructure build will offer.

Carbon capture and storage

The opportunity in carbon capture and storage

1.67 Carbon capture and storage (CCS) technologies have the potential to reduce emissions from fossil fuel power stations and industrial processes by around 90%[41]. They could therefore play an important role in helping to achieve the Government's climate change targets; supporting the transition to a low carbon electricity system while maintaining a secure and diverse energy mix; and reducing the costs of tackling climate change. The International Energy Agency (IEA) estimate that the global costs of tackling climate change would increase by 70% without CCS available as a proven technology for reducing emissions[42].

1.68 The UK is leading international efforts to develop CCS. We were one of the first countries to launch a commercial-scale CCS demonstration project in 2007, and were instrumental in securing EU funding to support a programme of up to twelve EU demonstrations and a G8 commitment to launch twenty demonstration projects by 2010. However, progress is still not happening quickly enough if CCS is to achieve its potential in tackling carbon emissions within the timeframes necessary to prevent dangerous climate change. We expect to see CCS starting to make a substantial contribution to UK and global efforts to tackle climate change in the early 2020s, which will require a concerted, shared effort to drive the technology forward over the next decade.

1.69 We must, therefore, step up efforts for the development and deployment of CCS. In the consultation *A framework for the development of clean coal* published last month, the Government set out proposals for a new regulatory and financial framework to drive the development of CCS by:

- Providing financial support for up to four commercial-scale CCS demonstrations in Britain covering a range of CCS technologies.
- Requiring any new coal power station in England and Wales to demonstrate CCS on a defined part of its capacity: at least 300 MW net (around 400 MW gross).
- Requiring new coal power stations to retrofit CCS to their full capacity within five years of CCS being independently judged technically and economically proven. We will plan on the basis that CCS will be proven by 2020.
- Preparing for the possibility that CCS may not become proven as early as we expect.

1.70 Our actions to support CCS demonstration would see us at the forefront of a technology that could develop into a multi-billion global market through its deployment as part of a global effort on climate change mitigation. Estimates by consultants AEA Technology suggest that low carbon coal technologies could be

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[41] IPCC (2005) Carbon Dioxide Capture and Storage: a summary for policymakers, www.ipcc.ch/pdf/special-reports/srccs_summaryforpolicymakers.pdf

[42] IEA (2009) CO_2 Capture and Storage: A Global Call to Action, www.iea.org/textbase/speech/2009/Kerr_NCCSA.pdf

worth £2-4 billion a year to the UK by 2030, sustaining between 30,000 and 60,000 jobs, with a cumulative value of £25-45 billion between 2010 and 2030[43].

1.71 We have the opportunity to sow the seeds of future CCS business clusters in areas of high carbon dioxide emissions, around which a new infrastructure and industry in the UK can develop. Each demonstration project offers the potential to be a hub for a wider CCS business cluster and could stimulate cluster development by encouraging other organisations to move or set up in the locality to share expertise and experience. This would encourage innovation and thereby enhance our competitive advantage. The Humber, Teesside, Thames Gateway, the Firth of Forth and Merseyside are all potential locations for CCS projects and cluster development, which would create new jobs as part of the low carbon economy.

Challenges and barriers to market in carbon capture and storage

1.72 If CCS is to fulfil its potential to make a significant contribution to combating climate change, fossil fuel power stations with CCS will need to be able to compete with other low carbon technologies. However, CCS is currently at an early stage of development and investment is very costly and risky. So, market forces alone are unlikely to deliver sufficient investment in innovation to take CCS from where it is today to commercial deployment.

1.73 The critical next step is commercial scale demonstration. Each of the different stages of CCS – capture, transport and storage – has already been used successfully in other applications. However, while pilot CCS projects for power generation (up to about 30 MW) have been taken forward and will provide valuable lessons, CCS has never been applied at commercial scale as an end-to-end process on a power station – and this transition to commercial scale is the critical next step.

Addressing barriers to market in carbon capture and storage

1.74 Underpinning the transition to low carbon electricity generation is the EU Emissions Trading System (EU ETS), which has set a cap on the level of emissions that the heavy industrial sectors – including power – can emit since 2005 and creates a carbon price.

1.75 The improvements to the EU ETS agreed between EU Member States in December 2008 will help provide a clear, long-term market signal for investors. We will continue to work for a robust EU ETS with a cap on carbon dioxide emissions that tightens in line with our climate change objectives. As the cap tightens, the carbon price should rise and more expensive options for reducing emissions will become progressively more economically attractive. Assuming that a series of successful demonstration projects reduce the costs and risks of CCS, we might expect the carbon price under the EU ETS to start to drive CCS deployment on coal power stations in the 2020s.

[43] AEA Technology (2008) Further Value of Coal Carbon Abatement Technologies to the UK Industry, www.aeat.co.uk/cms/assets/MediaRelease/PR_190609.pdf

1.76 However, while the long-term conditions are there for CCS to be successful in Britain, in the short-term the Government will have to provide targeted support for the commercial scale demonstration of the technology.

1.77 The Government launched a competition for a CCS demonstration project in November 2007. It will be one of the first in the world to demonstrate the full chain of capture, transport and storage at commercial scale on a coal-fired power station. Budget 2009 confirmed the Government's intention to proceed with the competition, subject to receiving suitable bids and final funding approval in subsequent spending reviews.

1.78 As the first step, Budget 2009 also announced £90 million from Government to fund detailed design and development work (FEED studies). Once complete these studies will reduce project risks and provide greater clarity on costs. They will also ensure that preparation for construction can start at the earliest possible date. Selection of the preferred bidder will follow after the FEED studies are complete.

1.79 This year, the Government has stepped up its ambitions and set out plans that would see the UK providing funding for up to four commercial scale CCS demonstrations, including the project launched in 2007. This would represent a substantial contribution to global efforts to develop CCS technologies. It is proposed that this be supported by the introduction of a new financial incentive funded through a levy on electricity suppliers. The Draft Legislative Programme published last month for consultation contains proposals for an Energy Bill that would enable this to be taken forward.

1.80 The EU has announced two funding packages designed to contribute to CCS demonstration. It is hoped that at least one, and possibly two, UK CCS demonstration projects will qualify for some EU support from:

- Part of the European Energy Programme for Recovery (EEPR) amounting to €1.05 billion for CCS to be distributed between seven EU Member States with €180 million assigned for the UK. The European Commission launched its call for the EEPR projects on 18 May 2009.
- 300 million EU Emission Trading System allowances from the New Entrant Reserve to be used to support up to twelve CCS demonstrations.

1.81 The Government is, in parallel, taking forward a wider programme of work to support CCS development and deployment within the UK and globally. The Government plans to publish a CCS strategy later this year that will consider international development of CCS, including in the EU; UK business opportunities and jobs; infrastructure development; skills; capacity building and other supply chain constraints and technology development[44].

[44] Please see further information at: http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/ccs/ccs.aspx

Ultra-low carbon vehicles

The opportunity in ultra-low carbon vehicles

1.82 Britain has the capacity and potential to be amongst the best places in the world to develop, demonstrate, manufacture and use ultra-low carbon vehicles[45] (ULCVs). A fundamental shift in how vehicles are powered will create and expand markets for British based companies involved in innovation and advanced manufacturing.

1.83 The automotive sector is a mature and dynamic industry that must undergo a transformation if it is to play its role in a low carbon economy. The sector has increased its productivity to be among the leaders in Europe, employs over 150,000 directly and contributes nearly £10 billion GVA to the British economy[46]. However, 19% of UK greenhouse gas emissions are currently from road transport[47].

1.84 In the short-term, emissions reductions will predominantly be achieved through the use of sustainable biofuels, evolutionary improvements in existing vehicle technology and better traffic management. Britain will continue to benefit from a demand for its expertise in light-weighting, aerodynamic design, powertrain technologies and work to develop more efficient internal combustion engines.

1.85 Britain is also at the leading edge of developing sustainable biofuels. British companies can capitalise on the high standards associated with their biofuels, especially as they compete in European markets. There are also potentially high value-added opportunities for companies in the development of advanced biofuels.

1.86 In the medium to longer term, moves to ultra-low carbon road transport will be driven by ambitious regulatory standards coupled with penalties and incentives at the EU and national level[48]. While there is potential for many technologies to play a role, there is a widespread view that the majority of mass market ULCVs in the coming decades will be plug-in hybrid electric and all-electric vehicles.

1.87 Britain will aim to be a first mover in the large scale demonstrations of UCLVs and their supporting infrastructure. With its densely populated cities located relatively closely together and joined by excellent road links, Britain is well placed to act as a global testing location for the trial and development of vehicles and technologies. Success will be dependent on Britain staying at the forefront of ULCV demonstration and adoption.

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[45] This term includes non-internal combustion engine technologies such as battery electric (EV), plug-in electric (PHEV) and fuel cell vehicles. The UK remains technologically neutral but recognises that EVs and PHEVs will be the dominant ULCV technology over the next decade.

[46] Howleg et al (2009) The Competitive Status of the UK Automotive Industry, www-innovation.jbs.cam.ac.uk/publications/downloads/holweg_competitive.pdf

[47] UK Greenhouse Gas Inventory (2007), http://defraweb.defra.gsi.gov.uk/environment/statistics/globatmos/download/ghg_ns_20090326.pdf

[48] The recently adopted EU CO_2 target for cars is 130g/km by 2015 (averaged across a manufacturer's sales) and 95g/km by 2020. http://ec.europa.eu/environment/air/transport/co2/co2_home.htm

Challenges and barriers to market for ultra-low carbon vehicles

1.88 The move to alternatively powered vehicles is dependent on a new charging infrastructure. To date the market has been restricted by limited vehicle supply, a lack of global standards, technological uncertainty and, most significantly, higher costs. These restrictions are being overcome as major vehicle manufacturers respond to the increasing impetus to decarbonise transport, recognising the commercial opportunity and announcing mainstream plug-in electric models from 2011 onwards.

1.89 To ensure inter-operability across regions, between manufacturers and over time, standards for charging interfaces need to be developed through international bodies. The Government will continue its active and leading participation in all these fora.

1.90 The relative simplicity of first generation electric charging infrastructure provides low barriers to market entry and there are considerable opportunities for early movers. However, at present, charging infrastructure is not the core activity of any established industry – new players are needed to build this market. Britain will aim to be among the first to provide sufficient infrastructure for large scale vehicle fleets.

1.91 As with many new and evolving markets there are challenges for ULCVs around both the high cost for early products, and consumer perception. Currently, consumers may be wary of buying electric vehicles because of the significantly higher purchase price, the lack of visible charging infrastructure and concerns around battery performance and speed of ULCVs. Only when the technology is trusted by consumers, and when the price of ULCVs becomes competitive, will demand drive supply. The Government has a critical role in supporting the market in its early stages and creating an economic environment in which ULCVs can become a real alternative for consumers to higher carbon vehicles, and in ensuring that there is coordinated deployment on a national level.

1.92 ULCVs will fundamentally change where and how businesses can realise benefits from the manufacture and use of vehicles when compared to traditional liquid hydrocarbon fuelled vehicles. The lack of demonstration at scale to test the potential business models makes this area an unproven proposition for investors.

1.93 At a more immediate and fundamental level, the future of the British automotive industry depends on the core of its productive base surviving the current collapse in consumer demand which has resulted from the credit crisis and global recession. Britain also faces a challenge to retain high value research and development activities without an anchoring indigenous high volume manufacturer. If the scale of automotive production in Britain falls below a certain critical level, it will have a hollowing out effect on the British based supply chain.

Continuing to address the barriers to market in ultra-low carbon vehicles

1.94 The automotive industry came together in the BIS facilitated 'New Automotive Innovation and Growth Team'[49] to identify the strategic challenges facing the industry now and in the coming decades. The Government will produce its response this autumn, assessing the recommendations on leadership for the industry, the business environment, support for the supply chain, and an innovation roadmap for Britain.

1.95 In April 2009, the Government set out in *Ultra-low carbon vehicles in the UK*[50] a package of policy measures to strengthen Britain's capacity as a site for the development and production of ULCVs and drive their phased uptake by the British public. The last few months have seen momentum continue to build with announcements that nearly 500 lower carbon vehicles will be on Britain's roads in the next year[51].

1.96 The Government, through the Low Carbon Vehicles Innovation Platform, worth over £140 million, which brings together funding from the Technology Strategy Board, Department for Transport, Advantage West Midlands, One North East and the EPSRC, is looking to accelerate the market introduction of low carbon road transport vehicles and maximise the benefit to UK business.

1.97 Under the Technology Strategy Board's £25 million Low Carbon Vehicle Demonstrator programme, which is part of the Innovation Platform, more than 340 ULCVs will be trialled across Britain. This is the biggest trial of its kind in the world. The vehicles range from two-seater city cars right through to seven-seater multi-purpose vehicles (MPVs). Also in the trial are sports utility vehicles (SUVs), taxis, sports cars and hydrogen fuel cell powered vehicles. They will be driven by members of the public, government agencies and consortia member employees. Research will be carried out to look at the way the vehicles are used and charged on a daily basis as well as to investigate the perceptions of both users and the general public to these vehicles. This is a critical first step in helping position the UK as a major force in the development and understanding of the potential market for ULCVs.

1.98 To tackle the initial barriers in electric vehicles charging infrastructure, the Government has committed £20 million to support the installation of electric vehicle charging infrastructure in a number of UK cities through the 'Plugged in Places' framework[52]. **To match the demand from lead UK cities now, the Government is announcing today further funding of up to £10 million for accelerated deployment from 2010 onwards.** The Government will shortly publish the outline criteria for how to access these funds.

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[49] NAIGT (2009) An Independent Report on the Future of the Automotive Industry in the UK, www.berr.gov.uk/files/file51139.pdf

[50] HMG (2009) Ultra-Low Carbon Vehicles in the UK, www.berr.gov.uk/files/file51017.pdf

[51] This includes the ULCV demonstrator programme run by the Technology Strategy Board and the Low Carbon Vehicle Public Procurement Programme run by the DfT

[52] Further details will be provided in DfT (2009), The Carbon Reduction Strategy for Transport www.dft.gov.uk/carbonreduction

1.99 Alongside this, the Government will continue to work with partners such as the Energy Technologies Institute (ETI). The ETI will soon announce the first phase of its Plug-in Vehicle Economics and Infrastructure project, worth up to £3 million. Working with government, industry and cities, this phase will develop a roadmap to help the planning of infrastructure deployment and the understanding of how a sustainable economic environment can be created in the longer term. Future phases of the project will include consumer trials.

1.100 With charging infrastructure in place, Government funding worth £230 million will be made available from 2011 to reduce the price of electric and plug-in hybrid cars by around £2,000-£5,000[53]. This is timed to coincide with the expected rise in availability of ULCVs.

1.101 In total, the policy measures recently announced by the Government now provide direct investment of over £400 million for the development of ULCVs in Britain. This comes alongside the Automotive Assistance Programme, which came into effect in February. The scheme aims to unlock total bank and European Investment Bank support of up to £2.3 billion to provide support for automotive companies as they invest to create or sustain jobs, develop new technology, bring special value to the UK, maintain R&D in UK vehicle manufacturing and support the development of green technologies.

1.102 This is a challenging programme that demands an active co-ordinating role from government. *New Industries, New Jobs* made the case for government working in new ways to solve issues of strategic importance that cut across multiple agendas and interests. **To provide clear leadership for all parties and to ensure the maximum carbon and industrial benefits for the UK, Government will unite Whitehall interests through the new Office for Low Emission Vehicles (OLEV). OLEV will bring together in a single programme the interests of the Department for Business, Innovation and Skills, Department for Transport, Department of Energy and Climate Change, Department of Communities and Local Government and HM Treasury with an agreed focus and purpose. OLEV will link to the cities, the regions and industry expertise to deliver the policy package outlined in *Ultra-low carbon vehicles in the UK*.**

1.103 By delivering this package of measures, the Government will actively help to position the UK as one of the global leaders of ULCV development, demonstration, manufacture and use.

Low carbon buildings and construction

The opportunity in low carbon buildings and construction

1.104 The construction industry plays a significant part in Britain's economy. It has an annual output of around £115 billion, accounts for around 9% of Gross Domestic Product (GDP) and provides employment for around 3 million workers[54].

[53] Further details will be provided in DfT (2009), The Carbon Reduction Strategy for Transport www.dft.gov.uk/carbonreduction

[54] Office for National Statistics

1.105 The Carbon Trust estimates that buildings alone account for around 40% of the UK's carbon emissions, with non-domestic buildings responsible for approximately half of this. The step change required in the building and construction sector, to a large extent driven by the Government's climate change regulations, will bring with it great opportunity in the design, construction, maintenance and operation of low carbon buildings and infrastructure. It is the Government's ambition that British based companies are able to capitalise on these opportunities and are in a good position to compete effectively in the growing domestic, and global, low carbon building and construction markets.

Challenges and barriers to market in low carbon buildings and construction

1.106 The majority of the building stock that will exist in Britain in 2050 is already standing. While it is easier to design and build in the features required for high performing buildings, rather than to fit them later, we face the challenge of both raising the performance of existing buildings and ensuring that our new buildings meet higher environmental standards.

1.107 To meet these challenges we need an industry equipped with the skills for retrofitting existing buildings, using more innovative low carbon construction methods and materials. Low carbon skills provision within the construction industry is still in its infancy in Britain.

1.108 The technical capability of trade people is important, but there also needs to be greater understanding and prioritisation of low carbon imperatives from designers and clients, as well as senior facilities and buildings managers. Recent research from the British Green Building Council points to a continuing need for information, advice and guidance.

1.109 While there are a number of highly innovative construction companies in Britain, the sector as a whole has traditionally underinvested in research and innovation compared to other sectors. The sector is highly fragmented and supply chains are often unwilling to make use of innovative products or processes that require investment in skills and equipment. This is partly due to cautious clients, insurers and mortgage lenders, and partly a reflection of the project-by-project basis of much of the industry's employment.

1.110 For this reason, innovation in the sector has traditionally been incremental rather than paradigm shifting. It is only more recently, with the advent of increasing British and European low carbon legislation and regulation that the sector has recognised the need to innovate in order to retain, as well as expand, its current market position. However, there remains a serious information failure within the industry with respect to the scale of the necessary shift in the basic industry model.

Addressing barriers to market in the low carbon buildings and construction industry

1.111 The Government is addressing barriers to the development of the British based low carbon construction industry for both new and existing buildings and low carbon materials, including the development of the required skills.

1.112 In 2008, the Government published a joint Strategy for Sustainable Construction[55] with industry. This Strategy is intended to promote leadership and behavioural change. It includes specific commitments by industry and government to take the sustainable construction agenda forward. Progress on the Strategy is to be reported in September 2009 and subsequently in 2011.

1.113 To promote new specialist and professional skills within the industry, the Government is working with ConstructionSkills, the industry Sector Skills Council, to develop their strategies. Publicly funded centres of excellence are being developed for the provision of training and support for business. Examples include Suscon, Inet for Sustainable Construction, in the Thames Gateway and East Midlands respectively, which facilitate the delivery of training in low carbon construction skills and innovation to industry through partnerships with training providers, universities and local industry. Funding for these initiatives is being provided by Communities and Local Government, Regional Development Agencies and other partners.

1.114 The Government is also helping to stimulate demand in the retrofit market. For example, the Government's Heat and Energy Saving Strategy consultation, which closed in May, sets out an ambitious programme for retrofitting Britain's existing homes to improve energy efficiency. Key policy proposals include:

- widespread availability of home energy advice;
- development of new ways to provide financial support, such as 'pay as you save' finance packages; and
- consideration of new delivery models to allow a more coordinated approach to rolling out improvements to homes and communities.

If the ambitions set out in the consultation are achieved, there could be approximately 34,000 jobs installing and maintaining whole-house packages of energy efficiency improvements. The results of the consultation will be published this week and the final strategy will be published later in the year.

1.115 Further investment to support the development of the retrofit market comes from the Technology Strategy Board's 'Retrofit for the future' Small Business Research Initiative (SBRI) competition[56], launched in March 2009. The competition has challenged the industry to develop and demonstrate solutions for refurbishment of entire homes that deliver deep cuts in energy use and carbon emissions, aiming to stimulate the retrofit housing market and to develop the supply chain. Funding for this has been increased, in response to the interest shown by the industry and as a result of the additional money allocated to the Technology Strategy Board in Budget 2009. Future government procurement will take account of the results of the competition and the Knowledge Transfer Network for the Modern Built Environment (MBE-KTN) will be used to diffuse the results of the competition widely within the industry.

[55] HMG (2008) Strategy for Sustainable Construction www.berr.gov.uk/files/file46535.pdf

[56] Part of the Technology Strategy Board's Low Impact Buildings Innovation Platform

1.116 In 2007, the Government announced[57] an ambition for all new homes to be zero carbon from 2016. This was followed by an announcement in Budget 2008, of the Government's ambition that all new non-domestic buildings be zero carbon from 2019[58]. Since then, the Government has set clear milestones towards these ambitions and has been consulting industry on the detailed definition for zero carbon homes, to provide business with a clear basis upon which to innovate. The Government is also supporting the 'Zero Carbon Hub', a non-profit, public/private partnership, to monitor, coordinate and guide the zero carbon programme and engage organisations active in low and zero carbon homes.

1.117 The Technology Strategy Board's Low Impact Buildings Innovation Platform seeks to assist business in harnessing the growing market for environmentally sustainable new buildings through support for research and development, demonstration, and design competitions.

1.118 To encourage more efficient use of construction materials, the Government's Waste and Resources Action Programme (WRAP) has developed a voluntary agreement under which individual companies commit to reduce significantly the waste they dispose of in landfill through greater reuse, recycling and recovery.

1.119 The Government also has a number of initiatives in place to specifically help remove the barriers to the use of innovative low carbon construction materials, including biomass based products. These range from the publication of technical guides and environmental profiles for a range of crop based construction materials, to funding support for a new material processing plant and the building of a low carbon materials demonstration house at the Building Research Establishment (BRE) in Watford. **The Government is investing up to £6 million to construct 60 or more low carbon affordable homes built with innovative, highly insulating renewable materials.** The new scheme will demonstrate the viability of these materials, act as a catalyst for the renewable construction materials industry and engage the affordable housing sector in the low carbon agenda.

Low Carbon Aerospace

The opportunity for low carbon aerospace

1.120 Aviation is currently estimated to account for around 2%[59] of global carbon dioxide (CO_2) emissions, although projections released by the UK's Committee on Climate Change indicate that in the absence of policy action, global aviation emissions could reach 2.4 Gt CO_2 in 2050. This would be around a four-fold increase on today's levels. Aviation is responsible for emissions other than just CO_2, and recent research[60], updating earlier work published by the Intergovernmental Panel on Climate Change (IPCC), estimates that aviation accounted for 4.9% of

[57] CLG (2007) Building a Greener Future: Policy Statement, www.communities.gov.uk/documents/planningandbuilding/pdf/building-greener.pdf

[58] Similar ambitions exist across the whole of the UK, although the recommended route maps to zero carbon buildings may vary between the countries

[59] IPCC (2007) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

[60] Lee, D.S., et al. (2009) Aviation and global climate change in the 21st century, Atmospheric Environment

man-made climate impacts in 2005 when the impacts of carbon dioxide, ozone, methane, nitrogen oxides, water vapour, contrails, cirrus, sulphates and soot are all included.

1.121 Manufacturing companies are critical in ensuring the success of the aviation industry, and British aerospace companies are key players in their world markets with a turnover of almost £20 billion in 2007[61]. The UK has the second biggest aerospace industry in the world in terms of employment and turnover, and is one of only six countries involved in the design, manufacture and marketing of the full range of aircraft products.

1.122 Many more people fly today for both business and leisure, and more freight is moved today than 20 years ago. This has brought huge benefits in terms of the economy and has given those who live in Britain access to more of the world than ever before. But aviation emissions are growing and it is vital that steps are taken to make aviation less carbon intensive.

1.123 Compared with other sectors there are limited options in the short-term to reduce aviation's carbon emissions, although technological improvements will be vital to reducing emissions over time. There have already been significant changes over the last decades in the efficiency of aircraft, which are today 70% more efficient than the first commercial jets. That trend is continuing, with new models about 20% more fuel efficient per passenger kilometre than those they will replace.

1.124 Industry will drive and adopt technological improvements that will increase efficiency and reduce the environmental impact of the sector. The cost of aviation fuel has also provided a strong incentive to operators and manufacturers to increase efficiency. Improving the sustainability of aviation is a focus for research and development of British aerospace companies, with a significant percentage of their research and development budgets dedicated to improving environmental technologies including improving fuel efficiency.

1.125 By 2050, aviation is expected to have made significant progress in addressing emissions, although a step change in technology and use will be required in order to meet the Government's target to limit UK carbon dioxide emissions from aviation to below 2005 levels by 2050. The Committee on Climate Change will advise the Government on the delivery of this target by the end of the year. Technological improvements will also help deliver the Government's commitments and goals on air quality and noise.

1.126 Air travel is fundamental to our economy. In order for the sector to successfully meet the demands set by domestic and international emissions reduction targets, acting now to accelerate the pace of decarbonising the aviation sector is vital.

1.127 Aerospace companies in Europe have adopted a set of environmental targets proposed by the Advisory Council for Aeronautics Research in Europe (ACARE) that aim to deliver technologies to allow CO_2 emissions reductions of 50% (per passenger per kilometre) for new aircraft produced in 2020 compared to those produced in 2000. This progress will result from a combination of advancements

[61] UK aerospace industry survey (2008), www.sbac.co.uk/pages/24059849.asp

in engines, airframes and operational developments. The Government is actively involved in the ACARE agenda.

1.128 The Government announced in January its intention to promote an international agreement on limits on carbon dioxide emissions from aircraft, as are already in place for cars within the EU. This is now a priority for the International Civil Aviation Organisation (ICAO) Assembly, which endorsed this recommendation at its Council meeting in June. A subgroup of ICAO – the Committee on Aviation Environmental Protection (CAEP) – is working towards an indicative range for a fuel burn efficiency goal by February 2010. We are seeking a more definite goal in the 2010-13 CAEP round.

The challenges and barriers to market for low carbon aerospace

1.129 Aviation is a safety-critical industry, with long lead-times for technological developments, which have to meet exacting international standards. Aircraft have long life cycles compared to other forms of transport – over 30 years in 60% of cases. As such, aerospace research and development has always been characterised by high investment costs and long development timeframes. Low carbon aerospace is no different. The current economic situation clearly impacts on this. Partnerships and collaborations across the industry will be important in minimising the costs of research and development activity, with the Government playing a role in facilitating these and ensuring that the interests of British based industry are preserved. The UK workforce must also be equipped with the skills required to work with new aerospace technologies.

1.130 Aviation is also by its nature an international industry and the Government is committed to pressing for international action to create the right framework to drive emissions reductions in aviation over time. We are therefore calling for agreement at Copenhagen at the end of this year to establish a global sectoral emissions target for aviation, as part of a wider global deal, and we are seeking action through the ICAO to implement specific measures to meet these targets within an agreed timeframe. The Government is also establishing the 2050 carbon emissions target to set a clear long-term framework that will focus the industry and shape long-term investment decisions made by businesses.

Addressing the barriers to market in low carbon aerospace

1.131 Alongside its work in setting a clear and ambitious regulatory framework to drive innovation, the Government is an active partner with the UK aerospace industry, recognising its valuable contribution to the economy and building on its existing world class expertise, in a global market now acutely focused on more environmentally friendly products. For example, we support UK aerospace businesses in increasing their competitiveness and maintaining leading world class capability, through key drivers such as technology, skills, business process and supply chain improvement, and sustainable aviation.

1.132 In an important partnership, the UK Aerospace Industry, the Government, and academia – via the Aerospace and Defence Knowledge Transfer Network – have developed a National Aerospace Technology Strategy (NATS) Roadmap that

identifies the critical aerospace technologies required to ensure UK competitiveness in the global aerospace market, and to meet the ambitious environmental performance targets for aviation. We are working in partnership to fund and deliver these strategic priorities through the Technology Strategy Board collaborative research and technology (R&T) programmes – for example, in advanced composite aerostructures and environmentally friendly engine technologies. Through its support for NATS, the Government is also helping Airbus UK to develop more efficient wings with funding for activities such as the 'Next Generation Composite Wing' programme, led by Airbus UK. This will help maintain the UK's position as the Airbus Centre of Excellence on Wings and Pylons, through developing UK expertise in composite technology and the production of lighter composite components and wings.

1.133 The Government will continue to further encourage aerospace manufacturers to undertake important environmental research and development of low carbon technologies through tax credits, which currently provide between 130% to 175% relief on research and development investment in Britain.

1.134 In addition to research and technology funding, the Government provides access to finance for the civil aerospace sector through Repayable Launch Investment for programmes of national strategic importance. For example, we recently announced £113 million support to Bombardier Aerospace (Shorts) in Belfast to design and develop advance composite wings for the Bombardier CSeries aircraft; and £60 million to GKN for the development of the rear spar and trailing edge for the new Airbus A350XWB. Both these new aircraft will deliver new standards in environmental performance, with reduced emissions and noise levels. More widely, aerospace companies are supported through the Regional Development Agencies and Business Link via the range of simplified 'Solutions for Business' support initiatives, and through similar support products in the Devolved Administrations.

1.135 The Government is working closely with the skills network – including businesses, the Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTA), and the National Skills Academy for Manufacturing – to ensure that the skills requirements essential to deliver low carbon technology advances are met. SEMTA is taking a leading role in delivery of £100 million of funding through a compact to support training and skills development. In addition, the Society of British Aerospace Companies (SBAC) is developing a Skills Roadmap, which will identify the key skills required, aligned with the NATS Technology Roadmap, so that government resources and skills provision can be aligned to real demand. The joint aim is to make sure that the aerospace sector acquires the skills it needs to deliver a low carbon future.

1.136 Achieving supply chain improvement is also critical to the future success of the UK aerospace industry. The Government is therefore supporting the industry-led Supply Chains for the 21st Century initiative (SC21) – a change programme designed to accelerate competitiveness by raising the performance of aerospace supply chains. This will also increase the ability of companies to work together to design, develop and deliver more environmentally aerospace products.

Chemicals and industrial biotechnology

Opportunities in chemicals and industrial biotechnology

1.137 As the chemicals sector adapts to a low carbon economy, chemicals and materials will be increasingly produced using industrial biotechnology rather than high carbon processes and petrochemicals.

1.138 The global industrial biotechnology market is predicted to grow to between £150-£360 billion by 2025 in the chemicals sector alone[62]. Global industrial biotechnology chemical sales are currently estimated at £35-£53 billion. This represents 3-4% of global chemical industry sales (£1.25 trillion in 2008). The British market for industrial biotechnology is predicted to grow by 5-11% a year to between £4-12 billion by 2025.

1.139 Earlier this month, the International Council of Chemical Associations produced a report[63] highlighting the important role that the chemicals industry has in delivering a low carbon economy, both in terms of the technology required to directly reduce emissions from the sector itself and, more importantly, the role chemical products have in providing the base for low carbon manufactured products. Nearly all manufactured products are reliant on chemicals and the report highlights that the chemicals industry has a leading role in the development of low carbon insulation, lighting, solar panels, biofuels, wind power, carbon capture and storage, synthetic textiles, packaging, light-weighting of vehicles, lower temperature detergents, greater energy and motor efficiency through lubricants, piping and fertilizer and crop protection, amongst others.

1.140 This is significant for Britain, where the chemicals sector has a turnover in excess of £60 billion, and directly employs around 200,000 people, with several hundred thousand jobs in associated industries. Britain also has considerable research strengths in the sector – currently leading Germany, Japan, France, Canada, Italy, China and Russia. Its exports amount to £43 billion, with a trade surplus of around £6.5 billion, suggesting that Britain has a comparative strength in the chemicals industry. Britain is well placed to increase its market share in this growing global market. As the technological base of the industry evolves, it is important that this advantage is maintained.

Challenges and barriers to market in chemicals and industrial biotechnology

1.141 The Industrial Biotechnology Innovation and Growth Team (IB-IGT) put forward detailed recommendations on the action government should take to support development of this enabling technology. It highlighted that a key barrier to market facing British based innovators in this sector is the up-front cost associated with investment in demonstration of new technologies and an uncertainty of return. This issue is particularly acute for SMEs, who make up the bulk of firms in the sector. Currently, there is only very limited availability of pilot-scale

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[62] Figures in the following two paragraphs are taken from: BERR (2009) IB 2025: Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy, www.berr.gov.uk/files/file51144.pdf

[63] International Council of Chemical Associations (2009) Innovations for Greenhouse Gas Reductions, www.federchimica.it/Libraries/Eventi_0709_InnovationsforGreenhouseGasReductions/Agenda.sflb.ashx

fermentation equipment in the UK, yet this equipment is necessary for the production of industrial biotechnology. The IB-IGT identified the need for integrated strategic investment in demonstration-scale facilities in Britain.

Addressing barriers to market in chemicals and industrial biotechnology

1.142 Last month, the Government published its response to the IB-IGT report[64], **announcing its support for the development of an open access demonstrator unit, particularly for fermentation of up to 10 tonne capacity, with associated upstream and downstream facilities. It has agreed to fund £12 million capital expenditure for such a facility. To support SMEs in accessing these demonstration facilities the Government will make available an additional £2.5 million through an industrial biotechnology fund.**

Low carbon electronics and Information and Communications Technology

Opportunities for low carbon electronics and ICT

1.143 Around 597,000 million people in Britain are employed in the information technology (IT) industry, with a further 650,000 IT professionals working in other industries. In addition, over 220,000 people are involved in the design and production of electronic products, working in around 11,000 companies, most of which are SMEs.

1.144 While Information and Communications Technology (ICT) accounts for around 2% of the global carbon footprint[65], it also enables carbon savings in other sectors – for example by replacing goods and services with virtual equivalents and providing technology to enable energy efficiency. GeSI, the Global eSustainability Initiative, estimate that the intelligent use of ICT could reduce overall emissions by 15%[66] – identifying motor systems, logistics, building technologies and the energy grid as the key areas where 'smart' ICT can impact on emissions by enabling efficiency. ICT can also play a part in enabling a low carbon economy by offering virtual technologies – online shopping, teleworking and remote communication are all altering the way we live and work.

1.145 Britain is especially well placed in low carbon electronics design, particularly in power management devices that reduce costs and increase efficiency. There is also considerable long-term potential from the emerging field of plastic electronics to deliver new low carbon market growth for Britain in applications such as low-power displays, ultra-efficient organic LED lighting and organic photovoltaic solar cells. All these technologies are poised to make a significant contribution to carbon reduction. Britain has been at the forefront of much of the pioneering research and has world leading firms in this sector, with most elements of an embryonic supply chain in place. The global market for plastic electronics is currently around

[64] BIS (2009) Government response to the IB-IGT report to Government, www.berr.gov.uk/files/file51891.pdf

[65] Gartner Symposium IT Expo, 26 April 2007

[66] GeSi (2009) SMART 2020: Enabling the Low Carbon Economy in the Information Age

$1 billion but forecast to grow at an astonishing rate to $20 billion in 2012[67] and as much as $57 billion in 2019[68].

Challenges and barriers to market in low carbon electronics and ICT

1.146 The level of risk associated with innovative research presents a problem for the high tech, innovative SMEs in the sector, particularly given the long standing market failures in the provision of finance to small technology companies. This has been exacerbated by the current turbulence in global financial markets. Britain also has a shortage of graduates in the ICT sector with skills in science, technology, engineering and mathematics.

1.147 The sector as a whole is increasingly alert to the energy implications of products and processes and the need to move to measuring, understanding and managing carbon as a 'cost', but information and best practice needs to be spread quickly through supply chains.

Addressing barriers to market for low carbon electronics and ICT

1.148 There are already Government initiatives in place to encourage the development of energy efficiency solutions for British based business. The Market Transformation Programme focuses on achieving significant and lasting improvements in the efficiency of electrical products and consults annually on how the performance of energy-using products, including ICT, will need to improve over the next 10-20 years. The Enhanced Capital Allowance Scheme encourages businesses to invest in low carbon, energy-saving equipment and the energy efficiency proposals outlined in the Budget will stimulate further domestic demand for low carbon ICT products.

1.149 The Government, as Britain's largest purchaser of ICT, is also leading the way in reducing its own carbon footprint. The Greening Government ICT strategy[69] aims to make energy consumption of Government ICT systems carbon neutral by 2012, and to make them carbon neutral across their lifetime (including manufacture and disposal) by 2020.

1.150 The Government is also supporting business innovation through the activities of the Technology Strategy Board, which include support for collaborative research and development in areas such as plastic electronics; Knowledge Transfer Networks (KTNs) in Grid Computing, Digital Communications and Electronics; and Innovation Platforms in Intelligent Transport Systems and Services, and Assisted Living. The TSB's Low Impact Buildings and Low Carbon Vehicles Innovation Platforms also include a strong electronics and IT component.

1.151 The Sector Skills Council for Business and Information Technology, e-skills UK, has worked with employers and partners in IT and telecoms to better align Britain's IT skills with the needs of business.

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[67] Nanomarkets (2009) www.nanomarkets.net

[68] IdTechEx (2009) www.idtechex.com

[69] Cabinet Office (2009) Greening Government ICT: Efficient, Sustainable, Responsible, www.cabinetoffice.gov.uk/media/141533/greening_gov_ict080724.pdf

1.152 The industry itself is also engaged in GeSI, the Global eSustainability Initiative, to further sustainable development in the ICT sector. GeSI fosters global and open cooperation, informs the public of its members' voluntary actions to improve their sustainability performance, and promotes technologies that foster sustainable development.

Business and Financial Services

Opportunities in business and financial services

1.153 Despite the severe impact of the recession, Britain remains a globally leading financial centre and retains a comparative advantage in business services. Analysis by Ernst & Young shows that over a 10 year period to 2008 more than 25% of European investment in these two areas came to Britain[70]. Our strength in business and financial services will be an important enabler in the development of a range of specialist services and industries to support the transition to a low carbon economy.

1.154 The opportunity in these sectors extends beyond trading on carbon markets (which is addressed below). Emerging low carbon businesses will require financing and specialist business advice. Businesses planning strategically for a low carbon future will use environmental consultancy services. The broader need to move to a more resource efficient economy, and the recession, are already having a re-balancing effect on the business support sector, with a 31% increase in the major private sector consultancy income coming from economic and environmental advice between 2007 and 2008[71].

The future for these sectors in a low carbon economy

1.155 There is considerable growth potential for business and financial services, as a range of specialist service industries will continue to develop to support the move to a low carbon economy. Central to the competitiveness of these sectors is the maintenance of open and competitive services markets domestically, within the EU and globally, and a long-term regulatory framework that will encourage long-term investment. Unlike the other sectors addressed up to now in this strategy, there are no substantial barriers to market for British based firms in this area, except for the low level of awareness and importance which some client companies place on resource efficiency. The Government action to tackle this awareness issue is covered in Part 4 of this document. The Government will also continue to work with relevant partners to monitor, and when necessary tackle, any barriers to progress in this market.

Carbon Markets

The opportunity from carbon markets

1.156 Around the world, market mechanisms are being developed to cost-effectively reduce emissions by trading carbon as a commodity. The term "carbon market"

[70] Ernst & Young (2008)

[71] Management Consultancies Association (2009) A positive force for the economy

can be used to describe all those activities that facilitate this trading. For example, the EU Emissions Trading System, started in 2005, allows participating companies to choose how they meet their targets – by reducing emissions in-house or by purchasing carbon credits from their competitors or from international projects that reduce emissions abroad. The international market supports diverse professions from carbon traders and carbon fund managers to project developers and emissions auditors.

1.157 As more countries agree to carbon reduction targets it is likely there will be increasing numbers of carbon trading mechanisms. Many of the companies in the carbon market specialise in financial services but environmental technology providers and carbon advisors are also involved. The UK has been a leading player in the carbon market with 39% of all international credits bought in 2008 going to UK buyers. The market was worth $125 billion last year, a four fold increase over 2006, so opportunities for companies in the UK and around the world will continue to grow[72].

Challenges to developing effective carbon markets

1.158 Like most markets, the carbon market has been affected by the financial crisis with lower prices. Simultaneously the ongoing UN negotiations to reach an international agreement on climate change, including rules for a long-term carbon market, are creating uncertainty for companies involved.

Addressing the barriers to developing carbon markets

1.159 The carbon market is a young market and political decisions dictate its shape. The Government recognises the need for business certainty, and is committed to working towards an ambitious and comprehensive climate change deal at the UN negotiations in Copenhagen this December including strong carbon market provisions and new market mechanisms. The Government is also committed to reforming the current mechanisms where they can be made more efficient, enabling economic growth, as well as technology transfer in developing countries.

1.160 To enable British companies to access the opportunities in this market, the Climate Change Projects Office, established by Government in 2001, continues to promote British private sector involvement in the carbon market and to support British business wishing to become active in it.

[72] World Bank (2009) State and Trends of the Carbon Market 2009, www.siteresources.worldbank.org/INTCARBONFINANCE/Resources/State___Trends_of_the_Carbon_Market_2009-FINAL_26_May09.pdf:

Part 2:

Developing low carbon economic activity across the country

2.1 Although all parts of Britain face some common challenges in adapting to a low carbon economy, each nation, region and locality also has a particular set of challenges and capabilities of its own. For this reason, it is important to examine what impact the low carbon economy will have in different parts of the country.

2.2 Taking into account local differences will also be important for a just transition to a low carbon economy. Government policy should take account of how future costs and benefits are distributed across geographical areas and societal groups. For example, analysis indicates that in 2006 there were 16 sectors for which expenditure on electricity and gas accounted for more than 10% of gross value added. These sectors are disproportionately located in certain regions and countries of the UK. Around 1.9% of employment in Wales is accounted for by these sectors, 1.7% in the North East and 1.5% in Yorkshire and the Humber. In contrast, these sectors account for only 0.2% of employment in London and 0.6% in the South East. In addition to incurring costs, these sectors may also be at risk from 'carbon leakage', with high carbon industries potentially moving their operations overseas. More generally, the Government is working to ensure that impacts are minimised for all types of business by ensuring competitive energy markets deliver low-cost energy, by incentivising energy saving, and ensuring EU frameworks are fair to business.

2.3 Capitalising on distinct national, regional and local strengths will also be vital if Britain is to maximise future economic benefits from the move to low carbon. The low carbon agenda is already being embraced across Britain. In many cases, enterprising businesses and public sector partners are producing impressive results. For example, around Cambridge, the knowledge spillover from the university has created a hub of biotechnology excellence; a cluster of wind power activity is expanding north of the Tyne; Cumbria is actively promoting its 'energy coast'; and

a large share of biofuel companies in Britain are now locating in the area near the Humber. In many of these cases, an established industry has begun the process of transformation or a strategic decision has been taken by government and local industry to pursue economic growth through low carbon activity.

2.4 As with other parts of the economy, the co-ordination of government low carbon policy at the national, regional and local level is crucial. In accordance with the new national framework for regional and local economic development, central government will work with RDAs, local authorities and others to ensure there is a clear strategy for low carbon economic development. This section sets out how the Government will develop existing regional or local comparative advantages through the development of Low Carbon Economic Areas.

A more strategic approach across the regions

2.5 In April 2009 the *New Industry, New Jobs*[73] policy framework announced the Government's intention to define a single set of strategic priorities for sustainable economic development for all national, regional and local bodies. Within this national framework in England[74], Regional Development Agencies (RDAs) will, with their local authority partners, play an essential role in driving sustainable growth. Local authorities also have a critical role in developing their local economies as well as helping central government deliver its low carbon ambitions generally. This will mean:

- **A clearer articulation of national priorities**. Government, working with the RDAs and their partners, will develop a clearer understanding about where particular types of low carbon industrial activity should be developed, based on existing activity and regional or local advantages.
- **Better co-ordination at the local level**. To ensure that the various agencies within a particular locality have a shared understanding of the area's strategic priorities with regard to sustainable economic development. Legislation requiring all upper tier and unitary local authorities to undertake local economic assessments is currently before Parliament.
- **Greater collaboration between the regions**. Building on the RDAs' existing culture of sharing good practice to coordinate activity across the regions and in doing so creating economies of scale and greater reach for low carbon projects. Collaboration with other RDAs, as well as with devolved administrations, will also be important as the demand for a low carbon technology will, in many cases, not be confined to a single geographical area.

Low Carbon Economic Areas

2.6 There is clearly a set of low carbon activities and priorities which must be common across all regions. These include greater energy and resource efficiency, smarter low carbon procurement and the construction or retrofit of low carbon

[73] HMG (2009) Building Britain's Future: New Industry, New Jobs, www.berr.gov.uk/files/file51023.pdf

[74] These priorities will be set out in the Government's new guidance for regional strategies for England, on which the Government will consult later this year

buildings. But each nation, region and locality also has a particular set of low carbon challenges and capabilities.

2.7 It is vital that limited government support to overcome the barriers to market which are slowing the development of low carbon technologies, is concentrated where it can make the most impact and that central government focus is aligned with that of regional and sub-regional partners.

2.8 For this reason, the Government is developing Low Carbon Economic Areas (LCEAs) to accelerate low carbon economic activity in areas where Britain's existing geographic and industrial assets give a location clear strengths.

2.9 Each LCEA will be driven by a partnership of regional and sub-regional bodies and partners led by the region's RDA and relevant Local Authorities. LCEAs will operate in the context of the new single integrated regional strategies and the governance arrangements for these, and also the existing arrangements for Local Strategic Partnerships. They will adopt an explicit commitment to work together across agencies to develop the area's low carbon economic strength, increase learning rates and build effective supply chains. They will bring together in a coordinated and strategic manner local, regional and national policy levers including infrastructure development, planning policies, skills provision and investment. They will encourage inward investment by sending clear signals to the market about an area's strengths and commitment.

2.10 There is no specific model of what a LCEA must look like. The framework will be flexible, with a strategy agreed by local and regional partners depending on the maturity of the industry, the focus on manufacture, demonstration or deployment of technology, and the local circumstances.

2.11 There will be a firm expectation on LCEAs to network with those outside the area in order to spread best practice and help forge links between businesses and research institutions across the country – helping to build effective supply chains.

2.12 In developing a LCEA, we would expect partners to use the policy levers already available to them including:

- Working with local planning authorities on the possible use of Local Development Orders (LDOs) which would incentivise relevant low carbon development by removing costly and time consuming planning applications. **As part of the development of LCEAs, the Planning Advisory Service on behalf of CLG will offer financial incentives to up to twelve local authorities to pilot LDOs.**
- Targeted skills provision, building on the central government approach set out in Part 4.
- Other local incentives such as investment in relevant business support advice or provision of demand-side incentives such as free or reduced price parking spaces in the case of ultra-low carbon vehicles.

- Active pursuit of specialist inward investment to support their low carbon strengths, drawing on the resources and expertise of UK Trade & Investment (UKTI).

The South West: a world centre for wave and tidal energy

2.13 **The first Low Carbon Economic Area will be located in the South West of England and will focus on the development of marine energy demonstration, servicing and manufacture.** The South West has an obvious marine resource, successful existing activity with high growth potential and a high level of regional expertise in marine research, development and engineering. There is a clear regional commitment to collaboration between the RDA and other partners to develop this low carbon economic opportunity.

2.14 This will be strengthened with an investment of £19.5 million from central government, as set out in Part 1 of this document, combined with funds from the South West Regional Development Agency, the European Regional Development Programme and the private sector. Total investment in this marine energy economic development programme, including funds from the low carbon funding allocated in the Budget, will amount to around £100 million and will help consolidate Britain's leading position in the wave and tidal industry.

2.15 The South West LCEA will network with organisations in other parts of the country that are engaged in marine energy projects, including in the North East, the North West, Scotland, Wales and Northern Ireland.

2.16 The area will include the following elements:

- **Demonstration.** Wave Hub, part funded through £9.5 million from the low carbon funding announced at Budget, will be the world's first large scale wave energy farm, generating up to 50 MW of renewable energy and offering a route to commercialisation for wave energy companies in Britain. It will complement the facilities at NaREC in the North East and EMEC in Scotland and the support for marine energy developments in Wales. Wave Hub is the first consented wave farm in the world and the South West Regional Development Agency will be placing the first order for equipment this month, enabling the hub to be operational from summer 2010.
- **Research.** A world centre of excellence in marine science and energy research will be developed, building on the region's existing strengths and collaboration between higher education and business. The £15 million Peninsula Research Institute for Marine Renewable Energy (PRIMaRE), a joint initiative by the Universities of Exeter and Plymouth, is part-funded by the South West Regional Development Agency and the European Regional Development Fund. The institute has already been established with a team of 15 world-class academics and 60 researchers providing expertise in marine energy research, development and innovation.
- **Industrial acceleration.** Solutions for Business, the Government's streamlined portfolio of business support products accessible via Business Link, will be used to accelerate development of this new industry. The portfolio includes 'Grant

for Research and Development' and 'Grant for Business Investment' targeted at helping start-ups and growth businesses to access finance, exploit ideas and develop international trade opportunities.

- **Workspace for innovation.** A network of innovation centres, science parks and business premises will be established to create the right environment for innovative businesses in the sector and help them grow and thrive. This will ensure there is an appropriate supply of workspace and enable easier access to professional support in the critical early years.
- **Port infrastructure.** Improvements to strategically located port infrastructure will be supported to allow devices to be assembled, transported and deployed locally. This will capitalise on the existing marine engineering activity and skills base, and close proximity to the marine energy resource.
- **An industry forum.** The South West Regional Development Agency is establishing an industry forum to bring together industry, academics, local stakeholders and key public sector bodies to drive delivery of the marine energy industry in the South West. This group will directly inform future policy and investment decisions made by the public sector in the region, and engage with Government departments, devolved administrations and RDAs, Technology Strategy Board, ETI, Carbon Trust and trade associations to develop the national framework that is needed to underpin this Low Carbon Economic Area.

Future Low Carbon Economic Areas

2.17 Over the next six months, the Government will work with national, regional and local partners to identify further Low Carbon Economic Areas, examining where key opportunities exist, where there are local advantages and where local partners are strategically aligned and focused on delivery. Sectors where we will particularly look to develop such areas will include offshore wind, marine energy generation, the nuclear energy supply chain, carbon capture and storage and ultra-low carbon vehicles.

Delivering a Low Carbon Industrial Future in Scotland, Wales and Northern Ireland

Scotland

2.18 The Scottish Government announced 10 Energy Pledges earlier this year as part of a Greener Deal for Scotland. The Pledges, which complement UK Government policy on renewable energy, carbon capture and storage, infrastructure development, energy efficiency and sustainable transport, form a coherent approach to energy issues in Scotland. The actions – ranging across key areas of energy generation and transmission, energy efficiency and transport – are focused on addressing both short and longer term opportunities for Scotland to benefit from competitive advantage. Working closely with business and environmental stakeholders, Scottish Enterprise and Highlands and Islands Enterprise, the Energy Technology Partnership and local authorities throughout Scotland aim to create

new jobs, reduce emissions and save households and businesses money, thereby contributing to economic recovery and growth and to addressing climate change.

2.19 The Pledges support the key themes of the *Update on the Scottish Economic Recovery Programme*[75], published last month: jobs and communities; education and skills; and innovation and industries of the future. In May, the Scottish Government published a *Key Sector Paper* which shows that Scotland's energy sector is making a significant contribution to economic recovery and green jobs.

2.20 The *Climate Change (Scotland) Bill (as passed)* sets a statutory emissions reduction target of at least 80% by 2050 and a 2020 target of 42% with a power for the latter to be varied based on expert advice. The *Climate Change Delivery Plan*, published on 17 June 2009, identified 4 transformational outcomes which will need to be substantially delivered by 2030 to put Scotland on the correct pathway to meet the 2050 target. Underpinning these transformational outcomes is the need to give primacy to cost effective demand reduction and energy efficiency across all sectors. Delivery of the 10 Energy Pledges will make a vital contribution to delivering a low carbon economy.

2.21 Key initiatives currently under way include:

- The *Renewables Action Plan*, published this month as the Scottish Government's complement to *The UK Renewable Energy Strategy*[76], sets out action to build on Scotland's real progress in deploying onshore renewable energy and develop in parallel offshore wind and tidal energy and renewable heat to take advantage of Scotland's natural resources and technological base. The Scottish Government will publish with industry a Marine Energy Road Map in August.
- The Scottish Government published proposals to promote low carbon vehicles on 29 June.
- The Scottish Government will be consulting later in the summer on an *Energy Efficiency Action Plan*, designed to promote action across business, households and the public sector in support of economic, social and climate change targets.
- Following the publication on 1 May of a study which demonstrates that Scotland has the storage capacity, the natural resources, the technology and ambition to become Europe's leader in carbon capture and storage, the Scottish Government is now working with partners from industry and academia to develop a roadmap for deploying CCS in Scotland.
- The Scottish Government has launched the Saltire prize, the world's leading innovation prize for marine and tidal energy, and is launching the Scottish European Green Energy centre this summer to develop Scotland's role as a European and world leader on sustainable energy.
- The Scottish Government is working closely with the UK Government, OFGEM, Wales, Northern Ireland, the Republic of Ireland and EU partners on plans to

[75] SG (2009) Preparing for recovery: update on the Scottish Economic Recovery Programme, www.scotland.gov.uk/Resource/Doc/275465/0082606.pdf

[76] HMG (2009) The UK Renewable Energy Strategy, www.decc.gov.uk/en/context/cms/what_we_do/uk-supply/energy-mix/renewable/res/res.aspx

upgrade energy transmission and distribution infrastructure to meet the challenges of the low carbon economy, including sub sea grids.

Wales

2.22 The Welsh Assembly Government has recently launched *Capturing the Potential, A Green Jobs Strategy for Wales*[77]. This strategy delivers the commitment made in the One Wales programme of Government to develop a Green Jobs Strategy.

2.23 It is an important component in stimulating the recovery from the current economic downturn, as well as strengthening our commitment to combat the causes and impacts of climate change.

2.24 This Green Jobs Strategy sits within the context of the Welsh Assembly Government's Sustainable Development Scheme, *One Wales: One Planet*, under which sustainable development will be the central organising principle of the Welsh Assembly Government. The Assembly Government's approach to tackling climate change, and making the transition to a low carbon economy, is framed within that context and will be a critical element of putting the Scheme and our commitment to sustainable development into action.

2.25 The *Climate Change Strategy – High Level Policy Statement* was consulted on at the start of 2009 and the subsequent *Climate Change Strategy – Programme of Action* is now out to consultation. It sets out specific proposals aimed at reducing emissions in transport, the residential sector, business, the public sector, waste, agriculture and land use change. It builds on existing action in Wales and action being taken by the UK Government and at European level.

2.26 Within this context, the *Green Jobs Strategy* promotes the greening of existing jobs through more efficient use of resources and stimulates new green jobs by helping to develop skills, innovation and new technologies, and a strengthening of the low carbon energy sector in Wales. It aims to help businesses to be equipped to face the future with confidence, by seizing opportunities for growth and increasing their competitiveness. The Welsh Assembly Government aims to extract the maximum regeneration benefits in terms of new 'green' jobs, training and supply chain development. This work is being taken forward in conjunction with the private sector and Sector Skills Councils which will result in a skills delivery blueprint for one spatial area which can be applied to other regeneration areas in Wales.

2.27 The Strategy encourages the transition to a more sustainable economy through the way infrastructure, regeneration investment and procurement are planned and delivered; and by making it easier for citizens and businesses to embrace and take advantage of the opportunities.

2.28 New technology will be the key to meeting these targets and it will also provide significant opportunities for business development. Some examples are given below but include, for example, the diversion of waste from landfill into new products for beneficial use, and the increased provision and use of renewable and other low carbon energy sources, including harnessing the power of the marine

[77] http://wales.gov.uk/about/strategy/publications/business/greenjobs/?lang

environment. With large scale energy generation, Wales has been at the forefront of many energy and economic transformations of the last 100 years. This tradition of successful transformation is standing Wales in good stead for the all important decarbonisation of electricity generation by 2030. At the moment up to £50 billion of low carbon electricity investments in Wales are in prospect and the Welsh Assembly Government has an aspiration that by 2025, Wales will be self sufficient in renewable electricity.

2.29 With Wales' successful heavy industries, the Welsh Assembly Government will continue to work with the carbon-intensive businesses to maintain their competitive needs and carbon-efficiency rather than risk their relocation to countries with less demanding standards.

2.30 The aim is to support businesses in Wales in the transition to a more sustainable economy, and to capture the potential opportunities in new technology and innovation. Some examples of our actions are given below and also include efforts directed through our low carbon and advanced manufacturing focused science policy and the existing sector fora in Wales including those in the automotive, aerospace and construction sectors.

2.31 Much good work is being done already but the magnitude of the low carbon energy agenda means we must be doing more on the ground to match companies' products with the new market opportunities. In implementing the Wales green jobs strategy, both in Wales in supporting indigenous operations and overseas with our inward investment activities, the Assembly Government will be working with companies and other organisations to this end. Special efforts will be made in areas such as renewable energy where the Assembly Government's policy aspiration of producing more electricity each year from renewables by 2025 – especially from Wales' tremendous marine resources – than we annually consume as a nation, will provide a very strong local driver.

2.32 Whilst the main focus of this work inevitably falls on the economy, the Welsh Assembly Government is determined to ensure that substantial benefits accrue to citizens and communities across Wales. For example it is encouraging public sector leadership to have a clear focus on carbon reduction and improved energy efficiency for all new public sector buildings.

Examples of some key developments in Wales include:

A. *Flexible Support for Business – environmental support*

2.33 The Welsh Assembly Government has mainstreamed environmental support for business into its new business support service Flexible Support for Business. This Environment and Sustainability service was launched in May 2009.

2.34 Easy to follow, relevant environmental and sustainability guidance is available through a dedicated section on the Flexible Support for Business website, and via the Flexible Support for Business advice line. Through this advice line, all businesses will be referred onto the most appropriate part of the support infrastructure. The aim is to guide each business to tailored support to help them address their environmental and sustainability issues.

2.35 Specialist support providers include:

- **Carbon Trust Wales**. Address business energy use, capturing and reporting on carbon savings.
- **Envirowise**. Tackle waste reduction with businesses.
- **Waste and Resources Action Programme (WRAP)**. Support the reprocessing and recycling industry and have a focus on supporting new business opportunities in this sector.
- **Constructing Excellence**. Address sustainability issues within the construction industry in Wales.
- **Ecodesign**. Advise on minimising the life cycle impacts of products and services.

2.36 In addition, Business Resource Efficiency Coordinators are currently located in South East Wales. They undertake detailed environmental diagnostics with businesses, encourage behavioural changes, address training needs and more specifically address practical process and consumption changes within the businesses. Discussions are underway to explore how this support could be expanded to cover the whole of Wales.

2.37 Assistance and support for small businesses to identify environmental improvements are available from Regional Environmental Managers in South East, West and North Wales Flexible Support for Business regional centres.

B. *Advanced Materials in Wales – sustainable, low carbon solutions for aerospace*

2.38 The Welsh Assembly Government has directly invested in developing the physical infrastructure, learning and skills and supply chain businesses within the advanced materials sector in aerospace.

2.39 The vision being developed by the Welsh Assembly Government and key stakeholders is that by 2020 the Broughton – Deeside area will be recognised internationally as an applied knowledge hub for advanced materials and manufacturing systems. This will support a global thriving aerospace-led community based across Wales and encompass high value manufacturing and skills and applying new manufacturing technologies and processes.

2.40 These emerging technologies have acted as a catalyst for increased sustainability and low carbon solutions in service, product and technology supply chains. This has been enabled through the formation of a dynamic network of academic teams and institutions and developing the growth of innovative SMEs across the region.

2.41 The Welsh Assembly Government has directly funded through Airbus a capital and skills investment in Advanced Materials – which will be used as a key prime driver to enable real change within this new and emerging sector.

2.42 Stakeholders committed to and embracing these developments include SEMTA, Glyndwr University, Swansea University, Airbus, Hawker Industries, Deeside College, Barry College, Mersey Dee Alliance, Welsh Composites Centre Technium Optic.

C. *Corus and Dyesol invest in ambitious photovoltaic technology*

2.43 Corus, Dyesol and the Welsh Assembly Government have agreed significant funding to further progress the development of dye solar cell technology on steel for building integrated photovoltaic applications. Corus and Dyesol have been working closely for the past two years, and in January 2008 successfully completed a detailed 12-month study, which confirmed the feasibility of this technology for large scale manufacture on steel.

2.44 When commercialised, dye solar cell technology on steel for building integrated photovoltaic applications has the opportunity to become significantly more cost effective than other competing photovoltaic technologies and achieve high market capture. Extended product lives, lower material costs and steadily increasing efficiency gains make this technology suitable for large surface area applications on a range of building types.

2.45 Funding has been secured from the Welsh Assembly Government, allowing the next stage of prototyping and development to be undertaken. A new facility, based in North Wales, will become the home of Corus and Dyesol scientists and engineers jointly engaged on the development. Corus and Dyesol will be expanding the scope of their development activities and accelerating progress towards large-scale manufacture.

D. *Research and Development*

2.46 EU Structural Funding has been utilised to enable investment in high quality, high impact research and development. Welsh Ministers have agreed priority areas for funding following consideration of the Assembly Government's agreed strategic sectors, the latest Research Assessment Exercise results and a detailed mapping exercise. One of the major areas of R&D funding is the Low Carbon Economy (including climate change mitigation and adaptation issues).

2.47 Three of the major sustainability research projects currently underway in Wales are:

i) The Low Carbon Research Institute (LCRI). This is being supported by the Welsh Assembly Government until 2013. The four main streams of activity are:

- Low carbon energy generation, storage and distribution;
- Energy demand reduction including zero-carbon built environment, and work on large scale power generation;
- An energy Graduate School; and
- Partnerships with industry, research organisations and government.

The programme is already working on £12 million research projects in the areas of energy efficiency, micro-generation (heat and photovoltaics), large scale renewables (marine, biomass and wind) and decarbonising fossil fuel energy production, including carbon capture and storage and underground coal gasification.

ii) The Institute of Biological, Environmental and Rural Sciences (IBERS). This venture has received substantial support from the Welsh Assembly Government. Around 300 research, teaching and support staff conduct basic, strategic and applied research in biology from the level of genes and other molecules to the impact of climate change and bio-energy on sustainable agriculture and land use.

iii) Climate Change Consortium Wales (CCCW). The consortium undertakes a strategic reconfiguration of climate change research in Wales and increase international competitiveness, with a view to achieving sustainability.

E. *Zero Carbon Hub Wales*

2.48 In sustainable construction, the Welsh Assembly Government has established a Zero Carbon Hub Wales that acts as a focal point to coordinate policy and delivery and links with the UK Zero Carbon Hub over common areas of interest. The Zero Carbon Hub Wales is ensuring that the construction industry is fully involved in delivering our zero carbon aspirations and maintaining the momentum and credibility to allow Welsh industry to react quickly to market opportunities.

Northern Ireland

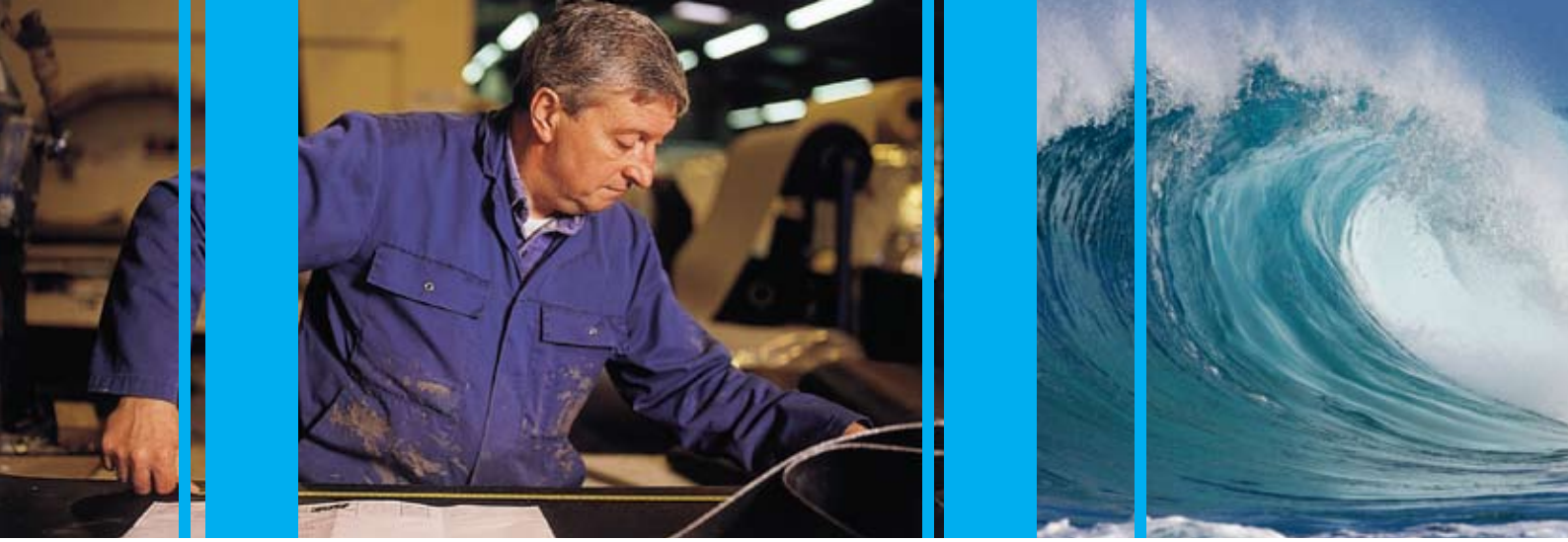
2.49 Established by Statute in 2002, Invest NI is Northern Ireland's Regional Development Agency and as such maximising low carbon opportunities for business fully falls within its remit. With an overarching corporate goal of halving the private sector productivity gap with the UK average, Invest NI's Corporate Plan 2008 – 2011 has set out core priority actions for economic growth in which a strategy for maximising the business opportunities in the low carbon economy fits neatly.

2.50 Whilst this strategy is currently being developed Invest NI's approach to date has embraced two complementary strands. As well as delivering against – and in line with – international, national and local policies on climate change, security of energy supply and sustainable production and consumption, Invest NI's resource efficiency activities are aimed primarily at increasing the productivity and competitiveness of businesses through more efficient use of materials, water and energy. These activities comprise funding the local delivery of nationwide programmes – The Carbon Trust, Envirowise and the National Industrial Symbiosis Programme – and providing up to five days' consultancy support to help clients scope or implement sustainable production and consumption projects.

2.51 Closely aligned with these activities are Invest NI's initiatives to help secure greater business for clients in renewable energy supply chains. Invest NI's locally focused initiatives have included:

- awareness raising and publicising of the business opportunities
- encouraging and facilitating business clustering and networking
- promotion of the region as a Foreign Direct Investment candidate for companies in renewables
- identification and promotion of regional strengths in low carbon technologies

- participation in DECC's Renewables Deployment Forum
- support of renewables trade missions overseas
- leading an Inter-Departmental group on sustainable energy business opportunities
- encouraging businesses and the local universities to establish centres of competence in renewables.

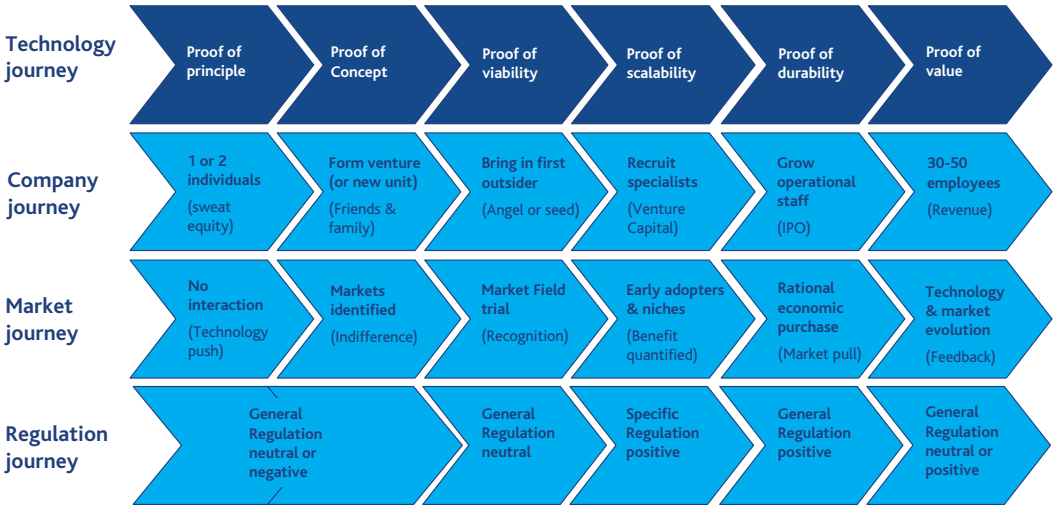


Part 3:

Growing innovative low carbon businesses in Britain

3.1 Companies commercialising innovative low carbon concepts will be central to the transition to a low carbon economy in Britain. While the range of innovations that will underlie the shift to a low carbon society and economy is ultimately very wide, the innovations that will drive sustainable economic growth will be those that develop a low carbon concept into a commercial product or service. This journey (**Figure 5**) from concept through commercialisation into a successful company is critical to making Britain one of the best places in the world to build innovative green businesses. This section sets out the measures the Government is taking to support innovative low carbon companies in Britain.

Figure 5 – From low carbon concept to low carbon company[78]



[78] Carbon Trust

3.2 The key driver of growth for companies producing low carbon goods and services is market demand. Increasing this demand will ensure that markets create a powerful incentive for low carbon innovation and the creation of specialist low carbon businesses. However, as set out in *New Industry, New Jobs*, there are often market failures associated with innovation investment, such as the inability to capture the full benefits of investment in innovation and system failures such as barriers to collaboration. Government needs to adopt a pragmatic approach to identifying solutions to these problems. This is especially true in the low carbon sector, where key innovations may involve entirely new technological approaches to standard industrial processes, such as vehicle propulsion, chemical manufacture or energy generation.

3.3 Britain has a range of existing strengths. We have a world class science and research base, a stable and supportive macroeconomic climate and flexible product and labour markets that encourage redistribution of economic resources to new ventures and growing sectors. Britain is also home to a large number of companies already involved in low carbon innovation.

3.4 However, there is a number of areas where strategic action from government is required to further strengthen Britain's potential. Targeted policy measures will be essential to tackle market failures preventing innovation and growth in particular sectors. It is therefore logical for Government to prioritise scarce resources towards sectors where its support is most likely to bring highest economic return for Britain[79], as outlined in Part 1 of this document. However, this is a fast-moving, dynamic marketplace and the emergence of new services, technologies and products are difficult to predict. It is therefore essential that Britain has an environment conducive to innovation and growth in the wider low carbon sector and which encourages and supports low carbon entrepreneurship more broadly.

3.5 Government action must complement the dynamics of the market to address market failures around innovation and company growth such as those identified in the Stern Review. These include ensuring funding exists for pre-commercial research and development over the long period required to reach market, as well as providing support to drive consumer demand for new, lower carbon solutions.

Increased support for the early stages of innovation

3.6 Over the last decade, sustained investment has given Britain one of the strongest science and research bases in the world. In recent years, the Government has established the business-led Technology Strategy Board (TSB) to drive technology-enabled innovation in the areas which offer the greatest scope for boosting British growth and productivity. The Government has also established the Energy Technologies Institute (ETI) as a unique private/public partnership to invest in the development and demonstration of low carbon energy technologies and solutions. Government support for innovation is reinforced by a successful research and development tax credit which has provided £3 billion of support to UK businesses

[79] Consistant with findings from Carbon Trust (2009) Focus for success: A new approach to commercialising low carbon technologies and HMG (2009) Building Britain's Future: New Industry, New Jobs, as well as views of other organisations

since 2000[80]. The Government has also funded the Carbon Trust to support the development and deployment of new and emerging low carbon technologies.

3.7 Despite this investment we have two important weaknesses: both British businesses and Government continue to invest less in research and development as a percentage of GDP than other comparator economies; and our excellence in generating knowledge is not consistently translated into innovative and commercially successful goods and services. Budget 2009 allocated £405 million of additional funding to support low carbon industries and advanced green manufacturing. As this Strategy sets out, a significant proportion of this will be directed towards targeted innovation support in key sectors such as offshore wind and wave energy. This funding will be delivered through channels such as the Environmental Transformation Fund, available through the Low Carbon Energy Demonstration product, part of the Solutions for Business portfolio.

3.8 In addition to this, Budget 2009 allocated £50 million of additional funding to the Technology Strategy Board, enabling it to increase its support for business innovation in areas of high growth potential including low carbon vehicles and buildings, and £90 million to fund detailed design and development work (FEED studies) for the CCS demonstration competition.

Closing the financing gap for growing low carbon companies

3.9 Turning the concepts supported by Government's investment in early stage innovation into commercially viable companies requires active and effective venture capital markets committed to the relatively long timeframes required to bring new low carbon products and services to market. There is evidence[81] to suggest that a significant market failure exists in Britain at the point before new technologies reach the marketplace, where funding for research and development has been utilised but where new revenue streams have yet to be generated by sales. Private sources of funding at this later stage of innovation are often scarce, due to the high level of risk and uncertainty of returns. The recent financial situation has made this issue even more acute.

3.10 Private sector venture capital investment in the low carbon sector has fallen significantly over the last 18 months undermining the ability of early stage low carbon companies to raise capital and survive. A recent report by the Carbon Trust[82], based on figures from New Energy Finance, suggests that the level of investment in the low carbon sector in the UK in 2008 fell below that of 2003 to €83 million, representing more than a 70% fall from 2007. The classic equity gap of investment rounds of less than €10 million continues to pose a real problem for pre-revenue and early revenue companies – and Europe as a whole is now falling dramatically behind the levels of venture capital investment that the US is putting into low carbon companies.

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[80] www.hmrc.gov.uk/randd/

[81] Watson, Jim (2008) Setting Priorities in Energy Innovation Policy: Lessons for the UK. Discussion Paper 2008-08, Cambridge, Mass.: Belfer Center for Science and International Affairs

[82] Carbon Trust (2009) Investment Trends in European and North American clean energy 2003 to 2008: The rise and fall of clean energy investment

3.11 **To address th is financing gap, the Government announced last month[83], the creation of the UK Innovation Investment Fund, to invest in technology-based businesses with high growth potential that require equity finance. The new fund will focus on investing in growing businesses, start-ups and spin-outs in the sectors of the future, including low carbon technology. The Government will invest £150 million to cornerstone the Fund and leverage additional private sector investment with the ambition of building this into a fund of up to £1 billion over the next 10 years.**

3.12 To build a healthy investment market there also needs to be widespread understanding of the Government's commitment to a low carbon economy, not least for investors to fully appreciate the potential financial returns. To communicate Government policy effectively and enable investors and innovators to share any difficulties or barriers they have identified, **the Government is working to bring together investors, innovators and policy officials in a three-way symposium, to be held in autumn 2009.**

3.13 Increasing the exposure of companies seeking finance to potential investors was recognised in the Government's 2008 Manufacturing Strategy[84] as an important way of helping to improve the flow of venture capital to low carbon innovators. There already exist fora for showcasing new environmental technologies. These range from online market directories such as can be found at Lowcarboneconomy.com, to competitions such as Shell Springboard, and exhibitions such as SustainabilityLive. The Government will continue to monitor and encourage activity in this area.

3.14 The Carbon Trust recently launched its 'Clean Tech Revolution' campaign, raising awareness of the opportunities relating to innovation in this area. The campaign will actively highlight the economic benefit that the Britain will capture from taking a leading position on commercialising key low carbon technologies and, through an innovation awards programme, will showcase real examples of British low carbon innovation.

Business advice for low carbon innovators

3.15 Many young companies lack the broader business skills needed to bring low carbon and environmental innovations to market. Specialist business incubator schemes such as those run by the Carbon Trust and the Energy Innovation Centre provide strategic and business development consultancy for early-stage businesses. They also provide access to networks which support individuals and businesses in accelerating innovative products and services to the market. Businesses who

[83] HMG (2009) Building Britain's Future, www.hmg.gov.uk/media/27749/full_document.pdf

[84] HMG (2008) Manufacturing: New Challenges, New Opportunities, www.berr.gov.uk/files/file47660.pdf

participating in such schemes enjoy much higher chances of attracting investment[85] and long-term success[86].

3.16 However, as a result of the credit crunch, many of these schemes are struggling to meet increasing demand. The Carbon Trust scheme, for example, has seen a notable increase in the number of applicants meeting its criteria in 2009, stretching its capacity to provide support. Other companies have relied on more generalised support from other sources, including RDAs. But the extent of this support varies across the country, with the majority of services unable to provide specialist advice on the development of the business. As part of its new framework for regional and local economic development, the Government will be encouraging local partners, such as RDAs, to develop their incubator support activities, focusing on providing specialist commercial and business advice.

Supporting low carbon innovation through procurement policy

3.17 A large element of the perceived risk of investment in low carbon innovation is tied to uncertainty over the scale of demand and price of the end-products. Used wisely, the purchasing power of the public sector can help to reduce this risk.

3.18 All central government departments will this year be publishing Innovation Procurement Plans that will embed a clear commitment to procuring goods and services in a way that drives innovation. These plans will set out how departments will identify the opportunities for using procurement choices to support innovation and set targets for doing so.

3.19 The reform of the Small Business Research Initiative, piloted in 2008 with the Ministry of Defence and Department of Health, will provide departments with a powerful tool for seeking technology innovation in their procurement of goods and services. The Technology Strategy Board is working with a number of departments including the Department for Transport, the Home Office and Communities and Local Government to develop projects that will be taken forward later in the year. These include the 'Retrofit for the Future' initiative (see Part 1), which will demonstrate solutions for improving the energy efficiency and environmental performance of Britain's current housing stock.

3.20 The Government is also promoting the use of outcome-based specifications by public sector procurers. In November 2008, the Government launched a competition on the theme of 'Innovation for Sustainability' to encourage projects using Forward Commitment Procurement (FCP) in which public sector procurers agree in advance to buy innovative goods or services. The competition aims to build up a community of practitioners able to promote the wider use of this technique throughout the public sector. A range of projects have now been

[85] To date, 82 companies have been or are being supported by The Carbon Trust Incubator scheme. These have to date raised a total of over £84.4 million of private funding .

[86] The European Commission Enterprise Directorate General (2002) Final Report: Benchmarking of Business Incubators, revealed that the survival rate of firms reared in an incubator environment was significantly higher than the business success rate amongst the wider SME community – estimated to be 80-90% (over a 5 year period), compared to 30-50% amongst wider community. The report also noted that the survival rate firms operating in more high-risk sectors such as high-tech industry may well be lower.

selected to receive advice and support in the use of FCP techniques, and will be developed to enhance understanding of the benefits of FCP.

Strengthening the innovation infrastructure

3.21 Government is also working to strengthen Britain's innovation infrastructure, notably around the areas of intellectual property and measurement frameworks. Standards for low carbon products and services are important in driving innovation, by creating benchmarks and informing consumer choice. Government's action in this area is covered in Part 4.

3.22 An effective and easy to navigate intellectual property system is essential for innovation, especially in high-tech areas, such as low carbon. The Intellectual Property Office (IPO) is developing a strategy specifically to facilitate the protection, management and appropriate exploitation of intellectual property connected with low carbon technologies. Recently, it has implemented a system for fast-tracking 'green' patent applications to allow inventors to secure the protection needed to help establish their technologies and attract investment. Other initiatives include the development of a framework for international collaborative intellectual property (IP) agreements to enable effective transfer of low carbon technologies among collaborators in different countries, particularly between publicly funded researchers and companies. The IPO also has a continuing programme of initiatives that promote awareness and effective licensing of IP and supports the Lambert[87] programme for collaborative research agreements.

3.23 The National Measurement System (NMS), the UK's national infrastructure of measurement laboratories, underpins business innovation by providing an infrastructure of traceable and increasingly accurate standards of measurement, enabling the benefits of new products and processes to be measured. The NMS currently focuses nearly 10% of effort on measurement research and services applied to environmental sustainability and energy supply. Subject to consultation, **the National Measurement Office proposes to set up a Centre for Carbon Metrology providing a focus for research supporting low carbon technologies. The Centre would enable the development of measurement and characterisation methods to put carbon trading on a firm scientific and technical footing, as well as providing confidence in data used to underpin innovative carbon reduction initiatives.**

Foreign markets and investment as a driver of low carbon innovation and growth

3.24 Foreign investment has a highly beneficial effect on the levels of innovation. The experience of international competition that comes with foreign investment often enables firms to increase their productivity and reduce their costs. Continuing to

[87] The Lambert tool-kit provides a suite of model contracts for university-business collaborative research projects which cater for different IP arrangements. These agreements are supported by extensive guidance materials and a decision guide to help users to consider the key issues when negotiating research contracts. They are supported by extensive guidance materials and a decision guide to help users consider the key issues that need to be considered.

attract high levels of foreign investment will be important to the commercialisation of British low carbon innovation. British businesses looking to lead globally must also start to look for growth opportunities in foreign markets. This is not always easy, especially for small, emerging companies.

3.25 UKTI has a central role in encouraging and assisting foreign direct investment projects in Britain. UKTI markets Britain, and the environment it offers for low carbon innovation, to business groups and sectors in overseas markets. It targets and pursues foreign owned companies which have the best potential for new and continued investment. It also maintains close relationships with strategically important existing investors in Britain, to encourage their further growth and to address any risk of disinvestment. The resources of UKTI were strengthened with a £10 million increase in funding in Budget 2009.

3.26 The Government and businesses are working in partnership through UK Trade & Investment (UKTI)'s Low Carbon Marketing Strategy to promote British low carbon solutions with a single compelling voice across the world to make Britain the destination of choice for low carbon trade and investment.

A coordinated approach to government support for low carbon innovation

3.27 The importance of maintaining a number of channels for government support for low carbon innovation was reinforced by research by the Pew Centre[88], which recommended that policy-makers should channel new funds for research and development through multiple agencies because this will 'improve performance in fostering innovation'. Nevertheless, it is very important that Government innovation support is delivered in a coordinated and efficient way. Government will therefore continue to support the complementary but dynamic relationship between the main deliverers of innovation support.

3.28 The Technology Strategy Board plays a cross-Government leadership role in delivering a national technology strategy and advising on polices which relate to technology innovation and knowledge transfer. Through activities such as its Innovation Platforms, it has been successful in creating critical mass and coherence so that UK business has greater clarity and is better able to access the most relevant support available.

3.29 In 2008, three of the main independent, publicly-backed bodies – the Technology Strategy Board (TSB), the Energy Technologies Institute (ETI) and the Carbon Trust – created the Low Carbon Innovation Group (LCIG), a strategic collaboration with a shared vision to deliver Britain's low carbon innovation goals, working together to accelerate the development and deployment of new technologies.

[88] Pew Centre (2003). Technology and Innovation Policies: Lessons for Climate Change

3.30 As highlighted in the Renewable Energy Strategy[89], **the Government will build upon the collaborative working arrangement developed by this group to further improve and strengthen the support for low carbon innovation by developing the remit and membership of the group. The Low Carbon Innovation Group will be expanded to include representation from the Research Councils, the Environmental Transformation Fund and, when relevant, Regional Development Agencies and Devolved Administrations.**

Box E – Main organisations supporting low carbon innovation

Technology Strategy Board. A business led non-departmental public body which plays a cross-Government leadership role in delivering a national technology strategy and advising on polices which relate to technology, innovation and knowledge transfer. It operates across various sectors of the UK economy to stimulate innovation in those areas which offer the greatest scope for boosting Britain's growth and productivity.

Energy Technologies Institute. A public-private partnership with leading international engineering and energy companies, investing in the development of low carbon energy technologies and solutions. It works by bringing more focus, ambition and collaboration to Britain's work in energy science.

Carbon Trust. An independent company working to accelerate the move to a low carbon economy. As well as providing business and the public sector with support and expert advice, it works to cut future carbon emissions by developing new low carbon technologies through project funding and management, investment and collaboration and by identifying market barriers and practical ways to overcome them.

Research Councils. The public bodies which fund basic, strategic and applied research and related postgraduate training, mainly in the academic base, across the UK.

Environmental Transformation Fund. Promotes business and public sector energy efficiency through investment in the development of low carbon energy technologies. It works through developing partnerships, funding, expert advice and large scale demonstrations.

Devolved Administrations and Regional Development Agencies. Promote regional economic development and growth, by investing in the capabilities of business and the knowledge base. Activities include supporting innovation through research and demonstration of new and emerging technologies and exploiting market and supply chain opportunities.

[89] HMG (2009) The UK Renewable Energy Strategy, www.decc.gov.uk/en/context/cms/what_we_do/uk-supply/energy-mix/renewable/res/res.aspx



Part 4:

A low carbon transition for the whole economy

4.1 The economic opportunities and threats arising from the shift to low carbon extend across the entire British economy. Effectively, every job will need to be a 'green' job. This strategy must therefore address not only the specific needs of businesses catering to the growing market for low carbon goods and services, but the needs of all businesses in making the transition to a low carbon economy. This section looks at six key areas of Government action that will reinforce the broader societal shift to a low carbon Britain and contribute to the drive towards sustainable development.

4.2 First, it sets out the action that the Government is taking to encourage organisations to take advantage of greater resource efficiency and energy savings. Not only are these important in their own right, but they are an important way of mitigating the costs of the transition to low carbon for many firms.

4.3 Second, it describes how the Government is facilitating the low carbon transition through a transformation of Britain's infrastructure. This includes ensuring Britain is equipped for the rapid connection of new forms of energy, develops the infrastructure necessary for low carbon transport, supports the move to greater energy efficiency and lower carbon business operations, and can manage new forms of waste disposal.

4.4 Third, it highlights the action the Government is taking to equip the British workforce with the skills they will need for success in the low carbon economy.

4.5 Fourth, it shows how the Government will drive the demand for low carbon products both through public sector procurement and by providing consumers with information and incentives to encourage them to choose lower carbon options.

4.6 Fifth, it emphasises the need for all organisations to adapt to the inevitable climate change and sets out Government's action in this area.

4.7 Finally, it stresses the need to ensure that the move to a low carbon economy in Britain is just and takes adequate account of the different ways in which workers across the country will be affected by the transition.

Capturing the benefits of resource efficiency

4.8 It is estimated that UK businesses lose 2% of annual profit through inefficient management of energy, water and waste[90]. The sooner UK businesses start to adapt to more energy efficient practices and embed these into their core operations, the earlier they can make cost savings, and secure the associated reputational benefits.

4.9 British businesses could save £6.4 billion per year from resource efficiency measures that cost little or nothing[91]. This figure is potentially much higher if more costly resource saving measures with a longer term payback are included. The cost of waste for UK firms is estimated to be around 4% of turnover[92].

4.10 Greater resource efficiency helps insure businesses against uncertainty in the supply of materials and price volatility in global markets. It also enables businesses to use their commitment to sustainable resource use to differentiate themselves from competitors in the eyes of customers or investors. Businesses can also show leadership by driving resource efficiency in their supply chains.

Addressing barriers to resource efficiency

4.11 Although the move to higher resource efficiency makes both good economic and environmental sense, there are a range of barriers that prevent take-up, many of which are particularly acute in smaller organisations. These include:

- scarcity of time and capital;
- a limited awareness of useful actions and how to implement them;
- the low priority given to the move to low carbon by senior management; and
- the regulatory framework may also be unintentionally increasing the cost or complexity of changing technologies or practices.

4.12 The Government has taken a number of actions to address these barriers. The most fundamental is the establishment of strong environmental policies that give businesses long-term signals and the confidence to move towards lower carbon practices. Britain has become the first country in the world to introduce a legally binding target to reduce greenhouse gas emissions and put in place policy measures to enable this to be met. These include implementing carbon pricing, carbon reduction and energy efficiency policies such as the EU Emissions Trading System (EU ETS), the Climate Change Agreements (CCAs) and the Carbon Reduction Commitment (CRC). The Government also sent a clear signal to business through the Landfill Tax. The Government has announced further

[90] Oakdene Hollins & Grant Thornton (2007) – Quantification of the business benefits of resource efficiency.

[91] Oakdene Hollins & Grant Thornton (2007) – This includes £3.3billion through energy savings, £2.7billion in relation to waste, and £400 million for water

[92] As estimated by Envirowise www.envirowise.gov.uk/uk/Our-Services/Resource-efficiency.html

increases to the Tax by £8 per tonne each year from 1 April 2011. The standard rate of tax will rise to £72 per tonne by 2013-14, providing a clear incentive to business to invest in waste reduction measures.

4.13 The Government has also introduced a range of measures to stimulate moves to greater energy efficiency in buildings. These are outlined in Part 1 of this document.

4.14 To help overcome the cost and finance availability barrier, especially evident in SMEs, the Government is providing financial support to help businesses purchase energy saving equipment through interest-free loans for SMEs, delivered by the Carbon Trust. **The amount of loans available over the next two years was increased by the allocation of an additional £100 million to this scheme at Budget 2009. The eligibility criteria for the scheme in England have also been revised so that more businesses can access funding. Changes include a reduced minimum loan value and increased maximum loan value, to enable support for a greater range of businesses and projects; there will also be changes to allow more medium-sized businesses to access the scheme. The funding is provided as part of Solutions for Business.**

4.15 The Government also provides financial incentives for the purchase of energy efficient equipment through Enhanced Capital Allowances, and for waste minimisation through Renewable Obligation Certificates for Anaerobic Digestion.

4.16 The Government has established a range of campaigns to raise awareness of energy and resource efficiency and offers direct help to businesses in this area through the Solutions for Business portfolio. Greater resource efficiency will increasingly be a focus of all Government advice and support services to business, and the Government is working with the British Standards Institution (BSI) to explore how standards could provide further help to businesses and other organisations in improving their resource use and waste management.

4.17 Later this year, the Government will also be launching a package to help SMEs better understand and respond to the opportunities and risks posed by the move to the low carbon economy. The package will consist of four key elements:

- **A commitment by large businesses to work with their supply chains to increase awareness of the opportunities and risks relating to the move to a low carbon economy, helping SMEs reduce their carbon footprint and develop low carbon products.**
- **A review, due to be completed in the autumn, by the Better Regulation Executive working with businesses, departments and regulators to:**
  - **assess how key regulations impact the efforts of British based businesses, especially SMEs, to adopt energy and resource efficient practices and technologies; and**
  - **consider whether any regulatory barriers to this transition could be reduced or removed, saving costs for businesses and maximising opportunities from this transition.**

- **A guide for business, by business, on the uptake, development and marketing of low carbon solutions, to be produced this autumn, by Tomorrow's Company, in partnership with businesses, Government and other organisations. The guide is being supported by Halcrow, HSBC, Ogilvy & Mather, Marks & Spencer and the Carbon Trust, among others.**
- **An examination of the potential merits of introducing a Low Carbon product to Solutions for Business, the Government's streamlined portfolio of business support products accessible via Business Link.**

4.18 Support services specifically targeted to help manufacturers move to more resource efficient processes and practices are a key area for further development. The Centre for Remanufacturing and Reuse already provides information and advice focused on tackling specific barriers in this area, such as product quality perception. **The Manufacturing Advisory Service (MAS) provides advice on lean manufacturing. The Government is providing up to £4 million to expand their services to provide more specialist advice to manufacturers on competing for low carbon opportunities.** The Carbon Trust will also be launching a new industrial energy efficiency accelerator programme, which aims to investigate energy use related to sector-specific processes and link these sectors with technology developers to demonstrate process changes or new equipment that can save energy and costs.

Public sector leadership

4.19 The public sector has a vital role in demonstrating and driving demand for resource efficient solutions. By taking on a leading role, it can create confidence among businesses to follow suit. It can also directly help create substantial demand through its procurement activity, helping to stimulate the supply of resource efficient solutions where it is affordable and demonstrates value for money.

4.20 Barriers to greater energy efficiency in the public sector are similar to those in private businesses, with lack of capability and capital being key issues, as well as the lack of priority for such activities. Government actions to address these barriers include an increased public sector focus on energy efficiency and carbon reduction through measures such as the Carbon Reduction Commitment. Revolving funds and zero interest loans for public sector organisations investing in energy efficient technologies and materials are available through the publicly funded Salix Finance, with Budget 2009 having made an additional £54.5 million available for such loans in England in 2009/10, supported by advice from the Carbon Trust to identify and specify suitable projects. To ensure that the public sector leads the way as it must, and that it implements measures to reduce emissions rapidly and effectively the Department of Energy and Climate Change is working with the Treasury to establish a cross-cutting review of energy efficiency in the public sector.

4.21 Government is also committed to showing leadership and stimulating demand for low carbon and more resource efficient products through its procurement activities.

Transforming Britain's infrastructure

4.22 *Building Britain's Future*[93] clearly sets out the importance of modernising our economic infrastructure, including energy, water, waste, communications and transport. **For this reason, the Government has announced that it will be establishing 'Infrastructure UK' – an advisory body which will identify the country's long-term infrastructure needs and bring a sharper focus to the Government's work on developing future infrastructure. Infrastructure UK will advise on coordination across infrastructure to tackle joint challenges such as climate change and the move to a low carbon economy**.

Energy infrastructure

4.23 In the years ahead, Britain will transform its electricity generation and energy grid to deliver power more efficiently and to adapt to new forms of power generation and new forms of demand for power, such as electric vehicles. Britain's energy deployment infrastructure will be driven by smarter network communication and control technologies to ensure that the whole system operates in the most efficient way.

4.24 In the medium to longer term, technologies such as smart meters and responsive appliances that react to changes in generation and demand will also have an important part to play. The Government believes that smart meters providing accurate real-time information on energy consumption could both change our energy habits in the short-term and provide an essential stepping stone to smart grids in the future.

4.25 Earlier this year, the Government launched a consultation on its approach to providing all households with smart gas and electricity meters, and all small and medium non-domestic sites with smart or advanced meters, by the end of 2020. The consultation closes on 3 August 2009. In April, the Government put in place new rules requiring the provision of advanced metering to large non-domestic sites by April 2014.

4.26 The Electricity Networks Strategy Group (ENSG), chaired by DECC and Ofgem, published a report in March, setting out an ambitious programme for network development that will support the connection of up to 35 GW of renewable generation. Delivering these reinforcements will require up to an estimated £4.7 billion[94] of new investment, in addition to current refurbishment and expansion plans of some £4-5 billion which have already been approved by Ofgem to ensure the grid is capable of supplying current and future electricity to our homes, businesses and industry. These reinforcements need to be built by 2015. The immediate priority is to provide certainty that essential design and pre-consenting work for the projects in the ENSG report can be urgently progressed. Ofgem has approved the up to £12 million needed to begin pre-construction work on these projects. The Government is also developing

[93] HMG (2009) Building Britain's Future, www.hmg.gov.uk/media/27749/full_document.pdf

[94] Electricity Networks Strategy Group (2009) Our Electricity Transmission Network: A Vision for 2020, www.berr.gov.uk/files/file50333.pdf

an 'Electricity Network National Policy Statement' to speed up planning approval for grid investment.

4.27 Last month, the Government announced a new offshore transmission regulatory regime to connect the potential 39 GW offshore wind in UK waters in the most cost effective and efficient manner. This regime will provide opportunities for new entrants to the market to design, finance, build and maintain offshore transmission assets with an estimated value of up to £15 billion. Competitive tenders, run by Ofgem, will start at the end of this month.

4.28 Ofgem is proposing to significantly increase the level of funding for trials of new smart grid technology over the period 2010-2015 through the Innovation Funding Incentive (IFI). A decision on this is expected later this year. **The Government will provide up to £6 million of funding to support early stage development of trials of key technologies consistent with a vision for smart grids in the UK to be published later this year. This will complement other sources of funding for network innovation, such as through the IFI.**

4.29 The Energy Technologies Institute (ETI) has also recently established a networks panel that is scoping projects on technology for onshore and offshore networks. The Government, through the Research Councils, is also providing over £30 million in direct funding for collaborative research in networks involving academia and industry.

4.30 By extending the exemption of indirect sales of 'Good Quality' Combined Heat and Power (CHP) electricity from the climate change levy, the Government will also help to unlock £2.5 billion of new investment in large scale CHP infrastructure. The Government will also be providing £25 million to fund ten new district heating schemes, supplying low carbon heat to communities.

Waste infrastructure

4.31 Britain's waste management infrastructure will also play a critical role in enabling the shift to a more resource efficient society and economy. The Government has made £2 billion in new funding available over the period 2008-11, to support local authority waste infrastructure.

4.32 The Waste Infrastructure Delivery Programme (WIDP) was established to assist local authorities in accelerating investment in the large scale infrastructure required to treat residual waste, recover energy and increase recycling levels. This includes financial help through Private Finance Initiative (PFI) credits and dedicated advice and support to individual local authority procurement projects.

4.33 The Government's Waste and Resources Action Programme (WRAP) is also supporting local authorities with advice on good practice, and demonstrations of waste infrastructure solutions.

Transport infrastructure

4.34 An effective transport system is key to the functioning of the economy, making it possible to deliver goods and services, and for us to get around in the most efficient way. *The Carbon Reduction Strategy for Transport*[95], published today, sets out how our transport networks will give people and business more low carbon choices about when, where and how to travel or transport goods.

4.35 In Part 1, this document sets out how the Government is enabling the ultra-low carbon vehicles market to develop, including through investment in the necessary recharging infrastructure to enable motorists to charge their vehicles when away from their homes and offices[96].

4.36 The Government is working closely with the freight and logistics sector to help industry maximise the opportunity to transport goods using lower carbon modes and to improve fuel efficiency through lower carbon technologies for HGVs and vans. The Government is also providing targeted capital and revenue support to enable companies to transfer their activities from road to rail or water.

4.37 On our railway network, the Government is supporting industry initiatives to improve the energy efficiency of rail operations, including through rolling out regenerative braking on electric trains; the trialling of biofuels; examining the potential for onboard and trackside energy storage; and rolling out the electric, diesel and hybrid Super Express Trains within the next five years. The franchising process will be used to encourage train operators to embed energy efficiency in their business and the Government intends to specify an environmental target for the rail industry in the next 'High Level Output' specification covering the period 2014-19[97].

4.38 Currently, about 40% of the rail network is electrified accounting for about 60% of passenger travel. Electric trains are more reliable and more carbon efficient. They can carry more passengers and are better for air quality than their diesel equivalents. The Government will soon be setting out plans for a major programme of rail electrification.

4.39 Rail may provide further opportunities for improving efficiency and reducing emissions from journeys between cities. A new company, High Speed Two[98], is advising the Government on the case for high speed rail services from London to Scotland. The company will report by the end of 2009 on the prospects for a new line between London and the West Midlands and will provide advice on potential development beyond the West Midlands, at the level of broad 'corridors'. This work will consider in particular the potential for extending this further to Greater Manchester, West Yorkshire, the North East and Scotland.

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[95] DfT (2009) The Carbon Reduction Strategy for Transport, www.dft.gov.uk/carbonreduction

[96] Further details on these measures are highlighted in DfT (2009) The Carbon Reduction Strategy for Transport, www.dft.gov.uk/carbonreduction

[97] DfT (2007) Delivering a Sustainable Railway – White Paper, www.dft.gov.uk/about/strategy/whitepapers/whitepapercm7176/hitepapersustainablerailway1.pdf

[98] DfT (2009) Britain's Transport Infrastructure: High Speed Two, www.dft.gov.uk/pgr/rail/pi/highspeedtwo/highspeedtwo.pdf

IT and digital infrastructure

4.40 As set out in Part 1, as an enabler to the whole economy, IT has the ability to increase energy efficiency by improving monitoring procedures and providing the tools to fine tune the control of business processes and activities. For example, logistics technologies reduce vehicle miles and fleet sizes; remote monitoring and analysis has the potential to reduce travel; energy management tools or sensors turn off computers and lights automatically; and advances such as technological convergence and broadband enable the creation of new business models.

4.41 The *Digital Britain*[99] report published in June sets out the economic importance of digital infrastructure. It describes the key obstacles facing those that are currently offline – availability, affordability, capability and relevance.

4.42 Of particular relevance to the future of a low carbon economy is the availability of broadband, both now and in the future. To ensure all can access and benefit from the network of today, *Digital Britain* confirms the Government's intention to deliver the Universal Service Broadband Commitment at 2 Mbps by 2012.

Equipping Britain with low carbon skills

4.43 Britain's low carbon skills base will be a determining factor in our ability to attract low carbon investment, successfully commercialise low carbon technologies, and innovate within companies. Increasingly every job in the British economy will require some understanding of energy or resource efficiency, or low carbon technologies and processes.

4.44 In May 2009 the Government tasked a Strategic Advisory Group of leading employers, including some of the country's largest companies as well as smaller companies, with suggesting how Government can boost demand for the skills required for the transition to a low carbon economy. A key recommendation was that there is significant potential for collaboration among employers within supply chains, supported by Sector Skills Councils.

4.45 Members of this group, reflecting on the experience of their companies, identified two key sets of skills:

- First, the core skills required by industry to produce the low carbon goods and services increasingly demanded by the market. While not all of the skills needed in this category can be currently known, we can identify a significant shortage in many essential skill areas related to Science, Technology, Engineering and Mathematics (STEM). This shortage is holding back business development, particularly where skills need to be transferred to new contexts. These skill shortages have been reported widely across the British economy, but are particularly acute in their application to specific low carbon technologies;
- Second, the more general skills that help a company or other organisation make and maintain the transition to low carbon operation. These skills include the communication, leadership and management skills to drive culture change, or

[99] BIS and the Department for Culture, Media and Sport (2009) Digital Britain: The Final Report, www.culture.gov.uk/images/publications/digitalbritain-finalreport-jun09.pdf

overhaul existing business practices. Other necessary skills include sustainable procurement, environmental management systems, risk management, monitoring and measuring.

4.46 There are also some newer activities specific to the transition to a low carbon economy which will require new skills from the workforce. These activities cover all sectors of the economy and include energy efficiency, full product life-cycle analysis, carbon auditing, carbon trading, resource efficiency and some additional IT skills to deliver sophisticated resource management systems. A major cross-sector effort will be needed to deliver these skills.

4.47 There are some key challenges to ensuring that Britain's workforce has the right skills in the right place in time to fully exploit the benefits from the move to a global low carbon economy. The first is the current lack of visible demand for such skills from employers, and the second, as a direct consequence, is the lack of supply of such skills.

4.48 Earlier this year, a Review of Evidence commissioned by Defra[100] concluded that there was latent demand for low carbon skills, but that this was not being articulated by employers and, as a result, the skills system was ill-equipped to respond. Recent surveys of firms in the traditional environmental industries sector suggest almost one in three has skills gaps, particularly in renewable and low carbon energy generation.

4.49 However, across the wider economy, there is still a low level of demand for low carbon skills from many businesses. This may stem from the low business priority given to the need to move to a low carbon economy. A key message from leading employers is that low carbon skills are synonymous with good business skills: businesses cannot deal effectively with low carbon skills issues until they have understood the business benefits arising from resource efficient ways of working. Once that link has been made, the demand for skills will follow. Surprising productivity gains can then be made, further strengthening demand. Understanding low carbon in terms of resource efficiency is seen by many leading employers as an important first step on the much longer 'carbon reduction' journey.

4.50 The broader low carbon 'sector' is not a sector as such, more an emerging 'cross-sector market'. This makes it much more difficult to identify future skills needs reliably. In 2007 CEMEP emphasised the 'whole economy' relevance of environmental markets. The Commission found that no single Sector Skills Council (SSC), or even small group of SSCs, could take on the strategic overview required across all sectors to build the evidence base from which to identify future skills needs, boost employer demand for those skills, and develop the necessary national occupational standards and qualifications.

4.51 An added complication is that a high proportion of the 2020 workforce is already in work, meaning that much of the higher level skills delivery will need to take place at work.

[100] Defra (2009) Skills for a Low Carbon Resource Efficient Economy; a review of evidence, www.defra.gov.uk/environment/business/scp/pdf/LCREE-final-report.pdf

4.52 The Defra Review of Evidence also found that the low carbon skills evidence base is incomplete. Reports had tended to focus on high level analysis rather than on specific job and skill requirements. Additionally, the research had been conducted mainly around sustainable development and the traditional environmental industries, rather than around resource efficiency and carbon reduction. As a result we have an evidence base covering aspects of low carbon jobs and skills but we do not have the complete picture. This confirms the CEMEP 2007 conclusion that reliable forecasts of future job prospects in low carbon markets were not available.

4.53 These uncertainties about the nature and scale of the jobs and skills challenge, and its implications for specific sectors, means the Government needs to take an 'activist' approach, working with employers and our skills partners to ensure we can deliver the low carbon skills we will need over the coming years.

Addressing barriers to developing low carbon skills

4.54 In *Building a Better Britain: New Industry, New Jobs,* the Government set out a commitment to this new activism from Government, working strategically to complement the market and position the UK to take full advantage of its competitive strengths. The policy framework described how Government must work with industry to develop strategies for ensuring that skills gaps are filled before they become a barrier to job creation or business growth.

4.55 The Higher Education Framework to be published in the autumn will set out how this activist approach will be applied in the HE sector. It will provide a comprehensive overview of the future role of HE, ensuring that Government supports the HE sector and employers to work together to address sectoral skills needs, including in the low carbon sector.

4.56 The Government will also publish a National Skills Strategy later in the year to put in place an approach to skills policy which prepares Britain for the upturn. Low carbon skills will be a critical component of this approach. The Government will sharpen its focus on supporting skills development in those low carbon industries, occupations and technologies that will drive economic growth.

4.57 As part of the Skills Strategy, Government will develop an active approach to addressing the labour market 'information gap' that has been identified. The Government will do more to forecast and identify skills needs in areas such as low carbon by developing with employers, Sector Skills councils and the UK Commission for Employment and Skills (UKCES) the practical and analytical capability to collect, process and deploy intelligence on skills needs in key sectors and markets quickly and effectively.

4.58 The Government will also ask the UKCES to produce a national strategic skills assessment every year. The assessment will focus on the medium to longer term priorities for skills that are critical to the sustainability and development of key industries and public services supporting economic growth and employment. The Government will act appropriately in response to advice on these priorities from the UKCES, and look to the new Skills Funding Agency and the Higher Education Funding Council for England (HEFCE) to take full account of these

strategically important areas in their work. The Government is currently exploring options for how this could be achieved.

4.59 From its inception in 2010 the Skills Funding Agency's remit will include ensuring that the skills system has the capacity to support development in areas of strategic economic importance, such as low carbon. The Skills Funding Agency will have the ability to make funds available to move the skills system in the required strategic direction, whilst also ensuring there are sufficient funds available to respond to emerging 'here and now' demand.

4.60 Alongside this work, the Government will seek to evolve the current higher education funding model to ensure our universities also have clear incentives to respond quickly to support emerging areas of potential growth.

4.61 The Government is committed to using the unique leverage of public procurement to promote skills training and apprenticeships. The Office for Government Commerce (OGC) recently published a new guide which provides public procurers right across Government with practical advice on how they can embed skills requirements throughout their procurement processes – both in letting new contracts, and working with existing contractors. More widely, the OGC is working with a range of partners and stakeholders to develop a clear framework for promoting Government policy objectives, including innovation and skills, through public procurement.

4.62 Economic regulators also have a vital role in shaping and supporting their respective markets. This role can include determining the level of investment in skills and training and addressing longer-term skills needs. In *New Industry, New Jobs,* Government committed to ensuring that regulators and regulatory frameworks all make a full contribution to raising skills levels.

4.63 Unions are also working increasingly with employers to help improve skill levels. The TUC, for example, has worked with some major employers to help train employees and TUC members in managing an organisation's resource costs. The benefits have been seen by companies in terms of increasing their resource efficiency and lowering costs, and workers in terms of increasing motivation and involvement in the business, and seeing how skills learned at work can be applied to domestic situations.

4.64 To ensure a better functioning skills market, the Government will seek to work with the market to ensure supply and demand are more in line with strategic priorities. It will also work with sectors to set out a roadmap of likely skills needs in key areas. Much of this can be achieved by shaping learner demand through better information, advice and guidance about course content, graduate destinations, links with employers, and what opportunities there are in the low carbon sector and what skills are needed to take them there. Closer working between employers and universities will be particularly important here, to agree what specialised course content employers need, and what they would be prepared to contribute to the cost of such provision (for example through employer co-funded foundation degrees).

4.65 To accelerate progress the Government will broker low carbon coalitions of leading employers, representing different parts of the economy, bringing them together with key representatives from the FE and HE system. These coalitions will be tasked with tackling particular skills gaps and shortages arising from the transition to a low carbon economy.

4.66 Such coalitions may also be particularly useful in supporting sector specific skills in Low Carbon Economic Areas. This could involve agreeing what specialised content employers need in FE and HE programmes and the rapid development of real time skills solutions. The Government, in collaboration with local partners, would discuss with the Skills Funding Agency and HEFCE options for incentivising the development of new provision, and how this could be demonstrated in a LCEA and then scaled up across the wider skills system.

4.67 This active approach to developing our skills base will be particularly important where skills capabilities determine Britain's ability to secure jobs at the top end of global value chains. Many higher level skills needs in low carbon industry are already met successfully by the market for skilled graduates which exists between individual universities and employers. The Government wants this model to continue, and will not seek to erode university autonomy or move towards a system of workforce planning.

4.68 The Government sees a strengthened role for Further Education colleges and adult education services alongside the fundamental role played in this area by Higher Education. There is clear potential for colleges and universities to work more closely with employers by exchanging knowledge through collaborative projects, knowledge transfer partnerships and the provision of vocational training courses. Employers will need help in establishing what their actual needs will be in terms of forecasting the type of jobs and skills that will emerge. Colleges and universities will need help in formulating their response, including in terms of infrastructure and workforce development.

Driving demand for low carbon products

The influence of consumer and business demand

4.69 Public understanding of the urgent need to address climate change is increasing. This includes an increasing awareness of the term 'carbon footprint'[101]. The raised profile and acceptance of climate change has a huge potential to shape market demand for low carbon goods and services through consumer and business preferences.

4.70 There is a clear opportunity for forward looking businesses to benefit from this emerging trend in the way they position their products and brands. Embedding sustainability within brands can set a product apart from a competitor, encourage consumer loyalty, reduce the risk of reputational damage and help recruit and retain staff. As a result, many high profile companies are rethinking their external and internal environmental strategies, and developing more sustainable products

[101] Defra (2008) A Framework for Pro-Enviornmental Behaviours, www.defra.gov.uk/evidence/social/behaviour/pdf/behaviours-jan08-report.pdf

and services. Environmental responsibility is moving beyond niche markets and into the mainstream. This emerging trend is also increasingly affecting the terms for business to business transactions, with larger companies in particular requiring stringent sustainability criteria of their suppliers.

4.71 Despite the encouraging shifts we are already seeing in consumer attitudes and awareness, there are complexities preventing these from being translated into substantial shifts in purchasing choices, especially at the individual consumer level. The main issues are around information and price.

4.72 Recent research shows that consumers currently find it difficult to know which products are better for the environment[102]. They want business and Government to make it easier to buy low carbon products and believe that sustainable purchasing choices should be clearer. Consumers also expect that business and Government should 'lead by example' by behaving in a more sustainable way – with many claiming that if business and Government did more, they would too.

4.73 The Government's role is to support the development of standards that give confidence to environmental claims made by businesses. For example, carbon footprinting of products helps businesses to better understand how their products and supply chains create carbon emissions and use resources, and helps consumers to compare products. PAS 2050, the first standard method in the world for calculating greenhouse gas emissions for individual products, was published in October 2008 by the British Standards Institution (BSI), co-sponsored by the Carbon Trust and Defra[103]. This will help businesses quantify the monetary and CO_2 benefits that cutting life-cycle greenhouse gas emissions can bring and give consumers the ability to differentiate between products. The United Kingdom Accreditation Service is also accrediting certification bodies to certify products and services to PAS 2050, to give consumers confidence in the declarations made by organisations using the new specification.

4.74 At the company level, forthcoming guidance for businesses on how to measure and report greenhouse gas emissions will help organisations to clearly and credibly report publicly on their emissions to customers and investors. The Government is also currently working with advertising and marketing practitioners to update and supplement its guidance on how to communicate responsibly on the environmental performance of products and services. As well as updating the general principles contained in the existing Green Claims Code, this work with industry professionals and other stakeholders should lead to more detailed guidance to help with the practical delivery of responsible marketing – for example, on how particular environmental issues can be handled in advertising and on challenges which arise for particular sectors. The aim is to support businesses in making good environmental claims and gaining market recognition for genuinely higher performance.

[102] Defra (2008) A Framework for Pro-Enviornmental Behaviours

[103] See www.bsigroup.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/

4.75 The other key issue hampering large shifts in consumer demand is price, with the majority of consumers either unwilling or unable to pay a price premium for lower carbon or generally more sustainable goods[104]. This barrier is most effectively tackled by measures that drive up the cost of high carbon goods and decrease the cost of low carbon alternatives. Although effective carbon markets can play a role, these are not enough to create sufficient differentiation in the cost to end-users in many sectors especially less carbon intensive ones. Targeted sector-specific initiatives, such as the introduction of product standards and end-user incentives, therefore have an important part to play. For example, in the case of lighting, the EU has agreed to a ban on the sale of all low efficiency lightbulbs by 2012 and some UK retailers are already no longer selling the least efficient bulbs. For business, Enhanced Capital Allowances provide tax relief for investment in a range of more efficient equipment including some high efficiency lighting units and controls.

Using public procurement to stimulate demand.

4.76 Government is committed to using its £175 billion annual procurement budget to show leadership and stimulate demand for lower carbon goods and services. We will do this by making appropriate revisions to the technical specifications mandated for use by Government procurement professionals and by stimulating supply in those areas where public sector demand is of sufficient scale to send signals to influence the market.

4.77 Government will also continue to use procurement to encourage development of innovative low carbon and resource efficient solutions through programmes such as the Small Business Research Initiative and Forward Commitment Procurement, as outlined in Part 3.

4.78 Central Government and its agencies have adopted challenging targets for resource efficiency and carbon emissions. Procurement decisions are aligned with these objectives, with minimum, mandatory environmental specifications – referred to as 'Buy Sustainable – Quick Wins' – in place for a wide range of priority product groups commonly purchased across government bodies, from energy using products and textiles to paper and food.

4.79 The Government's Sustainable Procurement Action Plan provides the framework for sustainable procurement across government departments, including on low carbon goods and services. Support for delivery and compliance with the framework by central government departments is overseen by the Centre of Expertise in Sustainable Procurement (CESP) in the Office of Government Commerce.

4.80 For high carbon impact products, more stringent best practice specifications have also been developed, both for those able to go beyond the minimum, mandatory standard, and to provide a signal to procurers and suppliers on the future direction of public procurement standards. For example, Government aims to purchase

[104] A survey carried out by Pricewaterhouse Coopers found that 48% of consumers were either unwilling or unable to pay the premium associated with more sustainable goods. Source: Pricewaterhouse Coopers (2008) Sustainability: Are consumers buying it?

Energy Star compliant (or above) ICT, including computing and imaging equipment, and is investigating solutions to ensure that the power management of products is optimised by suppliers. Government is also working to increase the average data server capacity use to a minimum of 50% where possible for improved efficiency and to ensure that all ICT consumables are either recycled or remanufactured at end of life.

4.81 To make it easier for procurement professionals to identify more environmentally sustainable choices, Buying Solutions, the national procurement partner for UK public services, has introduced a 'Greentick' facility[105]. A 'Greentick' next to a product, on the list of those available under Buying Solutions' Framework contracts, is the supplier's assurance that this product meets the 'Buy Sustainable – Quick Wins' specification. Products available through the Buying Solutions' frameworks can be searched by specification to identify those which suppliers confirm meet the 'Buy Sustainable – Quick Wins' standards. To date, eight suppliers have uploaded 'Greentick' product information covering eleven manufacturers and 370 products, including laptops, PCs, monitors, refrigerators and dishwashers.

4.82 The Access for All programme, implementing the recommendations in the Glover committee report, *Accelerating the SME economic engine*[106], will help lower the barriers to SME participation in public procurement, both as main contractors and in supply chains in low carbon activities.

Creating a climate resilient economy

4.83 Even with concerted efforts to reduce greenhouse gas emissions in the coming years, due to our historic and current activities and resulting greenhouse gas emissions, some climate change is inevitable for at least the next 30 years.

4.84 Climate change is already happening. The ten hottest years on record globally have occurred since 1990. In Britain, we have experienced water shortages in the south of England and we have seen increased incidents of flooding.

4.85 Climate change poses threats to business across the economy, from direct damage to assets to disruption across the supply chain. The future prosperity of Britain in a global low carbon economy will, to a large extent, depend on the ability of businesses to effectively mitigate these risks. This requires building climate change risks into decision making. This means, for example, changing the way we build our houses and infrastructure, better managing our water, and adjusting farming practices.

4.86 The need to create a climate resilient economy should also be considered an opportunity. Britain is already leading the world in many of the analytical tools necessary for effective planning for the impacts of climate change, as demonstrated by the new UK Climate Projections[107]. We now need to ensure that

[105] www.buyingsolutions.gov.uk/products

[106] HMT (2008) Accelerating the SME economic engine, www.hm-treasury.gov.uk/d/pbr08_economicengine_2390.pdf

[107] Defra (2009) Adapting to Climate Change: UK Climate Change Projections, www.defra.gov.uk/environment/climatechange/adapt/pdf/uk-climate-projections.pdf

we build the infrastructure necessary for a climate resilient economy. We also need to take advantage of the new markets and jobs that climate change may offer, such as in tourism, or from making new products to help us better adapt to climate change.

4.87 To help with this, last year, the Government set up an Adapting to Climate Change Programme, a cross-Government programme coordinated by Defra. The programme brings together the work already being led by Government and the wider public sector on adapting to climate change and will coordinate and drive forward the development of the Government's work on adaptation in the future. The UK Climate Change Projections[108] illustrate the extent of the changes the UK might face from climate change over this century – warmer and wetter winters, hotter and drier summers, an increased risk of coastal erosion and rising sea levels, and more severe weather events. The projections underline the importance of global action to reduce greenhouse gas emissions to prevent the most severe impacts of climate change. The projections will also help businesses and the public sector to plan and prepare for a future in a changing climate.

4.88 The Climate Change Act 2008 gave the Government a power – the Adaptation Reporting Power – to ask public sector organisations, and statutory undertakers (such as energy and water companies) to report on their assessment of climate risks and their plans to respond to these. **The Government is currently consulting on the proposed use of this power. In addition, all Government departments will be producing Adaptation Plans by spring 2010.**

4.89 Recognising the importance of creating a climate change resilient economy, **the Government will be shortly initiating a joint study with business representatives to look at the related climate change adaption opportunities for British based business in both the domestic and global markets. This will focus on: protecting areas of current competitive advantage from the impacts of climate change, and; identifying new opportunities, such as adaptation technologies and climate resilient infrastructure, where the UK is well placed to take advantage of future growth.**

A just transition to a low carbon economy

4.90 As with previous structural changes to the economy, a shift to a low carbon economy will affect each business, worker and family differently. This will depend on the sector a person works in, the type of job they are doing and where they are geographically located. Previous economic structural shifts have had huge social impacts, with some workers and communities being left behind as industries are restructured by change.

4.91 The low carbon economy represents a great opportunity for many people in Britain. However, as the nature of work changes, there will inevitably be transitional costs. These will impact on sectors of the workforce in different ways. As new opportunities arise in new markets, and as consumer demand changes to

[108] www.defra.gov.uk/adaptation

become more attuned to the need to address the issue of climate change, some existing products and services will change or may no longer be needed.

4.92 We will witness a shift in the nature of jobs in two ways. First, within existing sectors, as they seek to become more energy and resource efficient, the nature of jobs within those sectors will change. Second, the relative importance of sectors will change as new products and services create opportunities in different sectors of the economy.

4.93 Businesses will also need to adapt to the consequences of climate change itself – even if mitigation action is taken urgently, we can expect higher temperatures and increased incidences of flooding in the future, affecting different parts of the country and different sectors disproportionately.

4.94 With this in mind, it is crucial that the Government does all it can to ensure that there is a fair distribution of costs and benefits across the economy from the transition. Parts 1 and 2 of this document described some of the opportunities in Britain and across the different English regions. Moving forward, we must ensure that government policies fully take into account national, regional and local impacts. Furthermore, we must consider how our policies impact on the poorest in society. Aside from addressing this issue through industrial policy, the Government will encourage all households to make their homes more energy efficient, helping to bring fuel bills down.

28 Equipping Britain to take advantage of the shift to low carbon is a social obligation as well as an economic imperative. It requires policies that enable people to respond to industrial change positively, through the acquisition of new skills and access to new opportunities and new jobs.

4.95 In 2008, the TUC set out its views on a just transition to a low carbon economy[109]. In doing so, it described a set of 'Just Transition principles':

- **A meaningful environmental transition and sustainable development.** All sections of society should work together to prevent further damage to the planet's ecosystems;
- **Representation and employee involvement.** All sections of society should have the opportunity to have their perspectives voiced and considered;
- **Stable employment and long-term planning.** Long-term planning to preserve job equity and ensuring work conditions do not suffer in the transition;
- **Social justice and a fair distribution of costs.** Ensuring the costs and benefits of change fall proportionately on different sections of society;
- **Government backing and a united purpose.** A high level of commitment from all relevant stakeholders, including the Government, trade unions and business federations.

[109] TUC (2008) A Green and Fair Future For a Transition to a Low Carbon Economy, www.tuc.org.uk/touchstone/Justtransition/greenfuture.pdf

As part of this, the document suggested the establishment of a national framework or mechanism to ensure long-term planning and representative decision making on environmental transition. The Joseph Rowntree Foundation is also about to undertake a programme of work examining the social justice impact of climate change.

4.96 The Government is committed to doing all it can to ensure this just transition. **For this reason, we will create a forum for considering these issues and advising government. The new Forum for a Just Transition will include representatives from Central Government, national, regional and local bodies, Trade Unions, business organisations, and third sector bodies.**

www.hmg.gov.uk/lowcarbon

Department for Business, Innovation and Skills
Department of Energy and Climate Change
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