

Green Growth and Green Jobs

Transition to a Zero Carbon Britain

Policy Paper 109



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Executive Summary

Liberal Democrats are committed to achieving zero net greenhouse gas emissions from the UK economy by 2050. Our aim is that emissions in the UK should broadly be balanced by greenhouse gases sequestered in the UK.

The Liberal Democrat vision for a zero carbon Britain will deliver green growth and green jobs. We aim to improve energy efficiency and reduce fuel consumption and greenhouse gas emissions, by developing and commercialising new technologies in areas such as renewable energy, carbon capture and storage and low carbon modes of transport.

Moreover, investment in low carbon and environmental technologies will improve the UK's energy security and resilience, reduce dependence on imports of fossil fuels and protect consumers and businesses from oil and gas price shocks.

This paper sets out the framework for a long-term strategy to set the UK on the path to a carbon-neutral future and deliver the benefits of green growth, building on the work of Liberal Democrats in Government.

Stronger Policies for Green Growth

Liberal Democrats would strengthen the UK policy framework for green growth. A clear, durable and long term policy framework is needed, to provide investors with confidence. We would:

- Provide greater policy stability, by enacting a legally binding target for decarbonising the power sector by 2030, in the range of 50-100g of CO₂ per kWh of electricity.
- Facilitate investment in low-carbon technologies and infrastructure by giving the Green Investment Bank adequate and responsible borrowing powers and promoting the creation of green financial products.
- Develop and retain a skilled and flexible UK workforce.
- Promote low-carbon innovation by, for example, providing 'proof of concept' grants so that innovators with product or technology ideas can demonstrate whether they are worthy of further support.
- Ensure that local government plays a full role in the transition to a zero-carbon Britain by including carbon reduction targets in local development plans and encouraging local authorities to create arm's length local energy companies.
- Review how the planning framework is contributing to a zero carbon Britain and, if necessary, toughen up the relevant standards and guidance.
- Develop a comprehensive strategy for using public procurement power to help drive new markets in green products and services.

Liberal Democrats would press for a strengthened EU policy framework for green growth, including:

- Binding EU and member state emissions targets, as part of a 2030 energy and climate package, to reduce emissions by 50 per cent from 1990 levels.
- Swift and ambitious reform of the EU Emissions Trading System.

Green Growth and Green Jobs

- Better use of EU funds to steer investment into low-carbon solutions.

Promoting Energy Efficiency

Promoting energy efficiency is a key element of the Liberal Democrat approach. Measures that reduce demand can contribute more cost-effectively to meeting energy and climate goals than supply-side measures. Energy efficiency has great potential for future growth and driving innovation. Liberal Democrats would aim to halve total energy demand by 2030.

We would improve energy efficiency in domestic buildings by:

- Transforming the Green Deal into a comprehensive one-off programme to bring all homes up to the EnerPHit standard by 2050, focusing initially on households suffering from fuel poverty and homes in off-gas-grid areas.
- Offering differential final stamp duty rates on home transactions.
- Providing incentives to local authorities to reduce council tax rates for those who can demonstrate significant improvements in a home's EPC ratings.

We would target energy efficiency improvements in commercial, services and public sector buildings by, for example, stepping up measures to ensure compliance with energy standards in new non-residential buildings.

We would encourage and empower domestic consumers to reduce energy use by pressing for improvements in the EU energy efficiency labelling scheme, promoting the smarter use of energy in households and taking further measures to help people to pay greater attention to the way they use energy.

Decarbonising Electricity

Even though Liberal Democrats will prioritise more efficient use of all forms of energy, the level of demand for electricity will remain significant and could increase by 2050. The Committee on Climate Change has advised the UK Government to take action to decarbonise electricity completely by 2030 in order to stay on a cost-effective trajectory to achieving the 2050 climate change goals.

Liberal Democrats want to greatly increase the role of low carbon sources in the electricity mix, so that by 2050 they meet all the UK's electricity demand.

Renewables

We would promote renewable electricity by:

- Developing a more diverse generation and supply market, with a greater role for smaller, independent and community renewable generators and suppliers.
- Promoting community energy projects.
- Providing support for new low carbon technologies and business models through the Green Investment Bank.
- Reducing planning barriers to renewable energy developments.
- Supporting binding and ambitious greenhouse gas emission targets for the EU and its

- member states.
- Helping onshore wind developers to engage with local communities.
- Encouraging investment in offshore wind.
- Keeping the government's cap on new dedicated biomass plants, and ending support for all new biomass for electricity generation after 2020.

Nuclear New Build

Either Option A

Liberal Democrats reject the construction of a new generation of nuclear power stations.

Or Option B

Liberal Democrats accept that in future, nuclear power stations could play a limited role in electricity supply, provided concerns about safety, disposal of radioactive waste and cost (including decommissioning) are adequately addressed and without allowing any public subsidy for new build.

Role of Gas

To meet our ambitious emissions targets, the share of unabated gas generated electricity should be reduced significantly by 2030 and after that date, its role limited to balancing the system. The role of gas should be increasingly confined to heating rather than electricity generation in order to maximise its final energy output.

Liberal Democrats would:

- Not allow new gas-fired generation in the absence of a clear plan to recover heat for supply to industrial or commercial consumers or via a heat network.
- Permit limited shale gas extraction, ensuring that regulations controlling pollution and protecting local environmental quality are strictly enforced, planning decisions remain with local authorities and local communities are fully consulted over extraction and fully compensated for all damage to the local landscape.

Carbon Capture and Storage

Liberal Democrats would encourage the development of CCS technology centres or hubs in strategic regions of the UK and continue the programme of commercialisation of CCS by providing funding for a further two CCS demonstration projects. The use of gas (and coal) on a large scale after 2030 should be conditional upon it being fitted with effective carbon capture and storage (CCS) technology.

Balancing the Electricity System

A higher penetration of variable generation technologies such as renewables, e.g. wind and solar, requires more flexible management of the electricity grid. Interconnection to the wider European electricity market would enable the UK to buy and sell electricity in times of shortage and surplus. Liberal Democrats would therefore prioritise building more European interconnection capacity as a reliable, cost-effective and clean solution to balancing renewables.

Decarbonising Heat

Heating accounts for nearly half of total UK CO₂ emissions. Decarbonisation of the heat supply is, therefore, a crucial step to achieving a Zero Carbon Britain.

Liberal Democrats would:

- Require as a DECC planning condition that new UK fossil fuelled power stations are connected to a guaranteed use for their waste heat.
- Enable local authorities to zone areas where district heating should provide the heating for existing buildings, instead of gas, after a set date.
- ensure that biomass is used for heating fuel rather than electricity generation alone;
- Expand the use of low-carbon gas.

Decarbonising Transport

There is considerable potential for improved energy efficiency in transport. Action is needed to encourage people to switch to lower emission fuels and modes. Transport presents many opportunities for green growth and job creation through the development of the next generation of fuel-efficient and alternative energy transport technologies, and through the expansion of low carbon transport networks.

Liberal Democrats would decarbonise the transport sector by:

- Promoting walking and cycling.
- Promoting increased bus patronage and more fuel-efficient buses.
- Specifying that, by 2040, only ultra-low carbon vehicles will be permitted on UK roads for non-freight purposes.
- Supporting ambitious EU emissions targets for cars, of around 70g CO₂/km, to take effect in 2025.
- Supporting tighter EU emissions targets for vans.
- Developing a Vehicle Excise Duty (VED) escalator linked to the EU targets with a subsidy for the cleanest vehicles, paid for by higher VED on the highest emission vehicles.
- Preparing for the introduction of a revenue-neutral system of road pricing and supporting local authorities introducing road pricing in congested areas.
- Extending electrification of the rail network where there are clear economic and environmental benefits.
- Replacing air passenger duty with a per-plane duty, charged in proportion to the carbon emissions created by that journey.
- Promoting international action to reduce shipping emissions.
- Pressing for reform of EU policies in order to reduce support for unsustainable transport biofuels and end all support for food-crop-based biofuels after 2020.

Tackling Emissions from Industry

Emissions from industry accounted for around a third of UK greenhouse gas emissions in 2012. Liberal Democrats would:

- Assist energy-intensive industries to adopt low-carbon production methods and invest in energy-efficiency measures.
- Ensure that UK Trade and Investment and UK Export Finance withdraw fully from supporting all fossil fuel-related sectors, and instead increase support to exports of low-carbon technologies and services.

Agriculture and Land Use

Liberal Democrats would take action to reduce carbon emissions from agriculture and land use, including;

- Working with the European Commission to plan for a mid-term review of the CAP in 2017 to build on the current reforms.
- Adopting a National Food Strategy to secure the production and consumption of sustainable and healthy food.
- Expanding forestry.

Benefits for Consumers

Liberal Democrats would ensure that consumers win from the transition to a zero-carbon Britain. We would:

- Use the levy control framework to ensure that decarbonisation policies achieve their objectives cost-effectively and affordably.
- Create market-wide incentives for energy saving, or 'negawatts'.
- Promote collective switching initiatives.
- Bring new measures to assist households suffering from fuel poverty.

International Climate Framework

Liberal Democrats would work for a globally coordinated international response to climate change. We would:

- Play a leading political role in EU and international forums to secure an effective new climate treaty, containing emission reduction commitments from all countries, with the richer countries taking the lead, supported by a well-financed Green Climate Fund to provide assistance to poor countries.
- Pursue EU and international action to reduce hydrofluorcarbons (HFCs) and other 'short-lived climate forcers'.
- Promote international action to end net global deforestation by 2020.

Preamble

The Liberal Democrat vision for a zero carbon Britain will deliver greener growth, free the country from its dependence on fossil fuels and help save the world from the very gravest environmental threats.

We aim to improve energy efficiency and reduce fuel consumption and greenhouse gas emissions, by developing and commercialising new technologies in areas such as renewable energy, carbon capture and storage and low carbon modes of transport.

Liberal Democrats have an intrinsically green political philosophy; the green approach comes more naturally to us than it does to either the Conservatives or Labour. Free from vested interests, we have been more open to new thinking and more prepared to think for the long term.

With a philosophy based on liberty, rather than the defence of sectoral interests, we are pragmatic about using government intervention – regulation, taxation or behavioural ‘nudges’ – in whatever combination works best to deliver our objectives.

By putting individual consumers and citizens at the heart of our approach, we believe that rules, incentives and the simple power of good-neighbour community instincts can achieve remarkable changes in behaviour. Instinctively internationalist, we are enthusiastic about pursuing European and global solutions to international environmental problems. Traditionally decentralist, we understand the value, and the necessity, of community and local authority action.

The approach set out in this policy paper will deliver many economic benefits. The growth of the UK’s green technology, infrastructure and services sector in recent years has been a major success story. Britain’s share of the global low carbon environmental goods and services market was estimated at around £122 billion in 2010-11 – the sixth largest in the world. The green sectors have outperformed the wider economy since the downturn began and now employ almost a million people. Even in the depths of recession, they are growing at a rate of 4 to 5 per cent a year and generating a trade surplus of £5 billion. The UK is the world’s largest single market for offshore wind and currently leads the world in marine energy devices and installation development, leaving it well placed to compete in a rapidly expanding global market.

Our policies for a zero carbon Britain will create green jobs. The insulation industry already employs 30,000 people and the Green Deal will nearly double that, to around 60,000, over the next few years.

Liberal Democrats’ policies to mitigate climate change lay the foundations for new technologies, new industries and new sources of jobs and prosperity. Moreover, investment in low carbon and environmental technologies will improve the UK’s energy security and resilience, reduce dependence on imports of fossil fuels and protect consumers and businesses from oil and gas price shocks. In the short term the investment needed to replace Britain’s ageing power stations and to insulate its notoriously energy-inefficient homes and offices will help to revive the economy.

The risk is not that zero carbon policies will be too costly, but that Britain will fail to take the opportunities the zero carbon transition presents and allow green investment to flow instead to

countries like Germany, China, India and South Korea. Liberal Democrats are determined to seize this historic opportunity.

The zero carbon Britain of the future will have a prosperity that is more sustainable. Jobs will be more secure and less dependent on companies producing for a short-term 'throw-away' economy. Waste will be a thing of the past, as workers are re-skilled to carry out maintenance, repair and reprocessing. Wealth will come from genuinely creating value, not from exploiting finite natural resources. High efficiency standards and lifetime cost accounting will spur the transition; more wealth will stay in local communities, with many more small and medium sized businesses.

Britain's communities will be more harmonious and liveable. In towns and cities, people will have less need to travel long distances – with urban and 'green space' planning helping them to live, work and play in the same neighbourhoods. Energy for transport will come from clean sources, with both energy and infrastructure much more efficiently used. More heat and light for peoples' homes will be economically generated in local and community owned facilities, with water used economically and wasted less.

Homes, workplaces, shops and schools will be well insulated, staying cool in summer and warm in winter. People will spend a lower share of their incomes on energy - fuel poverty among vulnerable households will be consigned to history.

People will be healthier. Their diets will be less based on imported foodstuffs and life-shortening air pollution from burning fuels will finally be over. More walking and cycling will help people be less sedentary and more active.

Change on this scale won't happen quickly or without difficulty. Britain led the world in an industrial revolution – a powerhouse of engineering, investment and ingenuity. In the twenty first century, the zero carbon revolution demands no less effort or ambition. Over the next three decades this country needs to see a transformation on the same scale as the three centuries of industrialisation.

This policy paper sets out how Liberal Democrats, building on our work in Government, would set the UK on a zero carbon path for 2050.

A Framework for Green Growth

2.1 Transition to a Zero Carbon Britain

2.1.1 Liberal Democrats are committed to achieving zero net greenhouse gas emissions from the UK economy by 2050. Energy will always be imported and exported, and greenhouse gases will always be emitted from some activities. Our aim is that emissions in the UK should broadly be balanced by greenhouse gases sequestered in the UK.

2.1.2 This commitment represents the UK's domestic contribution to ensuring that international action on climate change contributes to the goal of limiting increases in global temperatures to within two degrees Celsius above pre-industrial levels. Two degrees is regarded as the maximum allowable to prevent catastrophic impacts of global change. An 80% reduction in greenhouse gas emissions was the target set by the Intergovernmental Panel on Climate Change for the global average reduction in emissions. Liberal Democrats believe developed economies should show leadership in reducing emissions, going further and faster where they can maintain competitiveness by deploying innovative and affordable new solutions, and using these solutions to support developing countries to make the low carbon, energy efficient transition.

2.1.3 We believe it is possible to get emissions down to 15% or 20% of their current level through maximising energy efficiency and renewables, encouraging behavioural change and without significant use of nuclear power or Carbon Capture and Storage (CCS). Remaining carbon emissions can be sequestered in the UK in building materials, for example by replacing carbon-emitting forms of concrete with carbon absorbing alternatives and greater use of wood in construction. Over the long term, technological innovations will also assist in achieving a zero carbon Britain. This policy paper sets out a framework to show how these targets can be delivered.

2.1.4 The Climate Change Act 2008 (CCA) established a legally binding target to reduce the UK's greenhouse gas emissions to 34% below 1990 levels by 2020 and to at least 80% below 1990 levels by 2050. The first four budgets under the CCA effectively require a reduction in greenhouse gas emissions to 50% of 1990 levels by the mid-2020s. In successive reports to Parliament, the Committee on Climate Change (CCC) has warned that underlying progress resulting from policy measures would – if continued – be insufficient to meet future carbon budgets. In its July 2012 report to Parliament, the committee reported that, after taking temporary effects into account, emissions would have fallen by 1-1.5% in 2012, compared to 3% annual emission reductions required to meet the third and fourth carbon budgets (i.e. covering the periods 2018-22 and 2023-27). The CCC said it is essential to provide more confidence to investors that the Government is committed to sector decarbonisation.

2.1.5 The UK's existing emissions targets and carbon budgets, even if met in full, would not place Britain on a zero carbon trajectory for 2050. A very significant step change will be required if such an ambitious goal is to be achieved.

2.1.6 Liberal Democrats in government have developed a range of innovative policy tools to achieve the UK's emissions targets and to develop a green economy and create green jobs include: the Green Deal, which aims to improve the energy efficiency of the UK's building stock;

electricity market reforms, designed to give energy companies stronger incentives to invest in low-carbon generation capacity; the Green Investment Bank, established to mobilise finance at scale from institutional investors; measures to build a strong skills base and foster low carbon innovation; support for renewable electricity and heat technologies; guaranteeing major investment in rail services; encouraging more sustainable travel behaviours; and the development of an external carbon price across different sources of emissions using market-based instruments.

2.1.7 The remainder of this chapter discusses how the core policy framework can be strengthened further. As Chapter 3 explains, promoting energy efficiency is a key element of the Liberal Democrat approach. In the past, energy efficiency policy has been largely limited to exhorting people to save energy, using labelling and standards, for example on appliances (at EU level), and limited investment in energy efficiency, focused almost exclusively on people in fuel poverty. Such an approach would be inadequate for the future. Energy efficiency measures need to be treated as importantly as investment in new forms of generation. This covers the provision of information, the use of regulation and enhancing access to capital, in order to influence investment decisions. In particular, we propose to significantly expand the Green Deal.

2.1.8 Subsequent chapters examine in more detail how Britain's energy supplies – in electricity, heat and transport – and in particular sectors – industry, land use and agriculture – can be decarbonised. Crucially, the paper explains how consumers can benefit from the transition to a zero carbon Britain. All of the measures are placed in the EU and international contexts.

2.2 Providing Policy Stability

2.2.1 The transition to a zero carbon Britain will be one of the most ambitious infrastructure replacement programmes in British history and a significant political, economic and technical challenge. Around a fifth of the UK's power plants will close by the end of this decade because they are too old or too polluting. Between now and 2020, the UK needs to attract around £110bn of investment in new, low-carbon electricity generation and grid infrastructure. That is a massive amount of money – double the current rate of investment and the equivalent of seven Crossrails.

2.2.2 Investors need to know that the market forces determining their returns are not susceptible to sudden shifts in Government policy. Potential political risk must be kept to a minimum to secure the low-carbon investment that is critical to realising the benefits of a green economy. Without stable and consistent policies for green growth, investors may assign higher risk premiums to the investments required, making the transition more expensive and difficult. Worse, they may decide not to invest in the UK.

2.2.3 Perceptions of political commitment are a key driver of investor certainty. Since May 2010, Liberal Democrat ministers have sought to establish key elements of the framework needed to establish a greener economy. However, their efforts have been undermined by the Chancellor's public criticisms of clean energy, which have weakened the stable and predictable framework for low carbon policy that industry needs.

2.2.4 Liberal Democrats would use the carbon budgets established under the Climate Change Act 2008, which we strongly support, to set a clear pathway to a zero carbon Britain. As soon as possible, we would put in place a legally binding target for the decarbonisation of the electricity sector by 2030, to help reassure investors in clean energy that there is strong political support for making the transition to a zero carbon Britain. The powerful signal provided by these statutory

targets would enable the UK to attract inward investment in building supply chains, creating new jobs and driving down the cost of low carbon electricity.

2.2.5 All government departments and agencies need to be consistently committed to delivering zero-carbon policies. The most important element is clear and consistent leadership from the centre of government. Liberal Democrats would therefore draw up an agreed set of zero-carbon objectives across government, create mechanisms to provide continuous monitoring of the performance of every department and agency against these objectives (reporting directly to the Prime Minister), and provide additional support from the National Audit Office to the Environmental Audit Committee to enhance its ability to provide external scrutiny. We would also move some key climate change policy functions, such as responsibility for product standards and for regulating hydrofluorocarbons, into the Department of Energy and Climate Change (DECC).

2.2.6 Many of the powers needed to implement our aim of a zero carbon Britain are devolved. Planning policy, for example, is devolved to Wales, Scotland and Northern Ireland. Northern Ireland has a different energy market framework. The effort to reduce emissions must be shared equitably but the different jurisdictions do not have equal opportunities and burdens. Liberal Democrats would work with the Devolved Administrations to ensure that our carbon budgets are delivered; and that implementation reflects the administrations' regional and local needs, opportunities and constraints.

2.3 The EU Framework

2.3.1 The overall climate and energy framework set by the EU is crucial. The current structure – binding targets for 2020 of a 20 per cent reduction in greenhouse gas emissions and 20 per cent of energy from renewables, together with an indicative target of a 20 per cent improvement in energy efficiency – is no longer sufficient to provide long-term certainty for investors in low-carbon technologies and infrastructure. It should be a high priority for the UK government – including the Prime Minister – to reach agreement on binding EU and member state emissions targets, as part of a 2030 energy and climate package. The Commission's suggested target of a 40 per cent reduction in emissions is not a credible stepping stone to achieving an 80 per cent cut by 2050; Liberal Democrats in Government propose at least a 50 per cent reduction by 2030.

2.3.2 The EU Emissions Trading System (EU ETS) is in urgent need of reform. The proposed backloading of allowances to 2020, whilst welcome, must be only the first step to long term structural improvements. Such reform should involve a combination of:

- A cancellation of excess EU ETS allowances.
- Increasing the linear rate of reduction of the number of allowances.
- The introduction of market management mechanisms.

2.3.3 The EU funds available to steer investment into low-carbon solutions should be better used, in particular to help poorer Eastern European states with many cost-effective opportunities to reduce emissions, for example through energy efficiency investments. At present, finance available from EU structural funds and the European Bank for Reconstruction and Development is often not used effectively; more should be done to improve the absorption and impact of such funding. Low-carbon objectives should be built into all other relevant EU policies, such as the Common Agricultural Policy.

2.4 Pricing Carbon

2.4.1 An effective system of pricing carbon is an essential, but not a sufficient, tool for achieving targets to reduce greenhouse gas (GHG) emissions and promoting investment in low carbon plant. A single, consistent carbon price across different sources of carbon emissions (and ideally across countries as well) is desirable to minimise the costs of emissions reduction.

2.4.2 Existing policies, the EU ETS, Carbon Floor Price, Climate Change Levy and the Carbon Reduction Commitment have not created a sufficiently stable, high and credible carbon price. The EU ETS covers around half the UK's GHG emissions, but current carbon prices under the scheme are too low to provide sufficiently strong incentives for reducing carbon emissions. As noted above, the EU ETS needs to be reformed if it is to provide stable and predictable carbon prices at an appropriate level.

2.4.3 The Treasury has introduced a Carbon Price Floor to provide more stability to domestic carbon prices. But this is a revenue-raising measure; it has limited connection with the market for carbon emission permits, and it will not reduce emissions across the EU, as the companies which reduce their emissions will simply sell more permits into the ETS market.

2.4.4 There is a strong case for harmonising and streamlining the existing carbon pricing measures and using a carbon tax on household energy to deliver a consistent carbon price, but now is not the time to introduce such a measure, given the pressures on consumers. A carbon tax would impact unfairly on low-income households, who spend a higher proportion of their income on energy than richer households and are more likely to live in poorly insulated homes. Liberal Democrats would only proceed with a carbon tax when our energy efficiency policies had been effective in addressing fuel poverty.

2.4.5 Another potential solution is the use of household carbon trading, covering electricity, gas and other fuels and the purchase of hydrocarbon fuels (linked to a car registration plate and even airline tickets). Household carbon trading could promote public understanding of low carbon choices and facilitate more equal taxes on the carbon content of fuels. Liberal Democrats would study and develop in further detail proposals for household carbon trading.

2.5 Financing the Zero Carbon Transition

2.5.1 Ernst & Young has estimated the gap between the investment needed in low carbon technologies needed by 2025 and the funds available from traditional sources of capital – such as utility companies, project and infrastructure funds – at approximately £330-360 billion. Following the credit crunch, capital investment in environmental sectors has fallen dramatically and long-term finance remains scarce.

2.5.2 Liberal Democrats in Government have set up the Green Investment Bank (GIB) to mobilise finance at scale from institutional investors. Launched in 2012, the GIB is capitalised by government with £3bn of funding for the period to 2014/15 with an additional £800m pledged in June 2013. However, to date it has limited powers to borrow and can only borrow on a piecemeal basis with individual agreement from the Treasury.

2.5.3 For the GIB to address the significant financing gaps for green technologies effectively and be at the heart of the zero carbon transition, it must have the ability to raise funds from capital markets sustainably and independently. There is tremendous potential for green investment through bond finance. Bonds are a natural investment vehicle for institutional investors who look for long term assets, and the Bank of England's base rate and long term interest rates are at historically low levels. Liberal Democrats would provide the GIB with adequate and responsible borrowing powers, so that it can access the billions of pounds in long-term funds from global capital markets and develop innovative new funding models.

2.5.4 In the longer term, the GIB should focus on technologies, like wave and tidal power and energy storage, and innovative business models, like development of Energy Services Companies and community renewables, where the GIB can act as a catalyst. The bank should use its scale and government mandate to encourage private finance and make a difference.

2.5.5 Liberal Democrats would encourage the creation of green financial products, giving members of the public more opportunities to invest in low carbon infrastructure. We would increase the allowance for green cash ISAs (which restrict lending to companies committed to sustainability) to that for stocks and shares ISAs, and increase the total allowance for individuals to save in green stocks and shares ISAs, including the extension of the ISA eligibility to include corporate green bonds. We would also provide tax benefits for 'green victory bonds' (National Savings Bonds), issued by National Savings and Investments, with longer maturity dates and carrying a higher yield, with the funds going directly to the GIB for green projects. Finally, we would increase the investment limit for Venture Capital Trusts and Enterprise Investment Scheme funds which invest in clean technology.

2.6 Skills and Innovation

2.6.1 The development and retention of a skilled and flexible UK workforce will be critically important to the cost-effective transition to a zero carbon economy.

2.6.2 Skills in science, technology, engineering and maths (the 'STEM' subjects), along with project management and communication skills, are particularly important for the rapidly growing environmental industries. Skills gaps in these areas are acting as a barrier to the low carbon economy. Liberal Democrats in Government are taking a demand led approach to meeting these needs, based on a partnership between government, business, trade unions, colleges, training

providers and their national agencies. We are addressing the skills implications of the transition to a green economy by:

- Assembling a new 'skills for a green economy' grouping of Sector Skills Councils to help businesses understand changing skills requirements.
- Improving the quality of information, advice and guidance available on careers in a green economy through the new National Careers Service.
- Establishing a renewables training network, with 2,000 places on training courses specifically tailored to those wanting to make the move into the renewable energy sector.
- Sending 'STEM ambassadors' into schools, and a 'See Inside Manufacturing' programme aimed at changing students' views on manufacturing careers.

2.6.3 The transition to a zero carbon Britain will require the deployment of new technologies, business models and service models. To support technology development an increase in research and development will therefore be needed. Various approaches are needed to cover the different stages and demands. Liberal Democrats would:

- Ensure that research councils have sufficient additional funding to support the scientific research needed to support major new technological breakthroughs.
- Provide small 'proof of concept' grants so that innovators with product or technology ideas can demonstrate whether they are worthy of further support.
- Seek partnerships with private companies and internationally to support technologies that have proven potential but need support before they can be deployed on a commercial basis.

2.6.4 Liberal Democrats would encourage the development of innovation clusters supported by regional higher education providers. The clusters would provide local businesses with the opportunity to benefit from new expertise and the latest R&D and equipment, and provide students with the opportunity to work on the latest technological advancements, creating new opportunities to generate prosperity.

2.6.5 New business and service models are also needed to deliver a high uptake of well-known technologies (like insulation and LED lighting). Whilst previous governments have supported a range of technological innovation, none have supported business model innovation. Liberal Democrats would develop a more diverse energy market (see Section 4.7) and promote new energy services business models, finance and leasing models, and new delivery models for energy supply and efficiency.

2.6.6 Areas worthy of specific technical and business support include fuel cells, new materials, new IT and control technologies, offsite fabrication for buildings, and power storage. We would also reserve revenue from the unconventional (shale) gas fiscal regime to increase finance for low carbon innovation programmes.

2.7 Local Government

2.7.1 Local government clearly has a vital role to play in delivering the transition to a zero-carbon Britain. Local councils are well placed to identify and implement local solutions such as zero-carbon building development, sustainable transport and renewable energy. To set an overall framework for this activity, Liberal Democrats would include carbon reduction targets in local development plans.

2.7.2 In the longer term, local authorities are best placed to encourage innovation when they have both power and responsibility; across Europe, local government in countries with a more decentralised structure is leading on delivering a low-carbon future. Fundamental to this approach is the municipal ownership of power generation, enabling power to be produced and consumed locally while also incentivising municipalities to improve energy efficiency and make better use of local energy resources, creating a municipal revenue stream alongside new local jobs and businesses. Liberal Democrats would:

- Encourage local authorities to create arm's-length local energy companies to produce, distribute and sell electricity and heat.
- Reinforce local councils' existing responsibilities for promoting energy conservation and eliminating fuel poverty in their areas, encouraging building insulation and the use of waste heat from power stations for buildings.
- Give councils more control over public transport provision, to provide greater opportunities for local public transport to make full use of local renewable energy resources.

2.7.3 We would consult with local government over the best way to enable local authorities to promote the local 'circular economy', ensuring that all resources (not just energy) are used with maximum efficiency and that waste is minimised, including encouraging local businesses, public sector institutions and householders to work together in making the best use of energy and material flows.

2.7.4 Local government also has a key role in helping to make local companies aware of the new opportunities opening up and helping to match them with big companies – e.g. renewable energy installers – looking for local suppliers. Often this function may be best delivered at a regional level; where appropriate regional structures do not exist, we would work with local enterprise partnerships and city deal local authorities to create them.

2.8 Planning

2.8.1 The planning system has undergone substantial changes in recent years. The new National Planning Policy Framework (NPPF) introduced in March 2012 has simplified planning guidance and included a presumption in favour of sustainable development (economic, social and environmental).

2.8.2 Although the principle of sustainable development runs through the NPPF, there is a danger that in seeking simplicity, Local Planning Authorities' interpretation and implementation of the policy may not actually deliver a more sustainable future, particularly where they have Local Plans that are incomplete, non-compliant or not up to date and thus challengeable by

developers. It also remains unclear to what extent the NPPF will contribute positively to creating a zero carbon Britain or to long term sustainability.

2.8.3 Liberal Democrats are clear that the core principles of the planning process should be to empower local people, enhance and improve places, provide amenities and contribute to well-being and the natural environment. Development should be sustainable now and remain sustainable into the future. We would therefore review how the planning framework is working in practice and, if necessary, toughen up the relevant standards and guidance. We would also ensure that Local Planning Authorities are supported when formulating and implementing their Local Plans.

2.9 Procurement

2.9.1 One of the most direct ways in which government can stimulate demand for more sustainable goods and services is by setting an example as the UK's largest purchaser; public procurement of goods and services accounts for about 10 per cent of GDP, £256 billion in 2010–11. UK timber procurement policy, which requires purchasing of legal and sustainable products, has helped to transform the UK market for wood products, providing a good example of the impact of procurement policy.

2.9.2 Government Buying Standards set minimum green purchasing standards for public sector buyers to follow, but these do not apply to some products (energy, for example), are often unambitious, and their implementation is not systematically monitored. Liberal Democrats would develop a comprehensive strategy for using public procurement power to help drive new markets in green products and services (including Energy Services). Rather than setting minimum product standards which encourage a lowest common denominator approach, we would make environmental measures (including, for example, consideration of whole-life impacts) the basis for competition amongst suppliers, alongside price and quality, thus encouraging a continuous increase in standards; this is in line with the European Commission's current proposals for the revision of the EU procurement directives. We would also extend green procurement policies to the broader central public sector – including the NHS and local authorities.

2.9.3 The Coalition Government has a good record in reducing carbon emissions from Whitehall buildings, achieving a 14 per cent reduction in its first year, and setting a target of 25 per cent by 2015. Liberal Democrats would extend this target to the broader central public sector and provide assistance to local authorities to adopt the same approach.

Reducing Energy Demand

3.1 Energy Efficiency

3.1.1 Energy efficiency belongs at the heart of a zero-carbon economy. Reducing energy use can cut energy bills for households and businesses, make the UK energy system more sustainable, and reduce greenhouse gas emissions. Energy efficiency can boost the economy in a sector with great potential for future growth, driving innovation in the process.

3.1.2 Previous Conservative and Labour governments have neglected the role that energy demand reduction can play in managing our energy system. Yet measures that reduce demand can contribute in a more cost-effective way to meeting energy and climate goals than supply-side measures.

3.1.3 Liberal Democrats in Government have created the Green Deal, an innovative policy to finance a mass programme of energy efficiency works on homes, business premises and public buildings, and set up the Energy Efficiency Deployment Office (EEDO) to drive forward the necessary step change.

3.2.4 Still, Britain has some of the least energy efficient buildings in Europe, despite evidence showing that investing in energy efficiency can produce returns of up to 20% a year. Well over half British homes are not properly insulated. The UK cement industry is 75% more energy intensive than the EU average and papermaking more than 35% more intensive. Public transport in the UK has the third lowest percentage share of journeys in the EU.

3.1.5 Liberal Democrats would aim to reduce total energy demand by 50% by 2030. Using the government's own pathways model, this is not only completely feasible, it would deliver our objectives far more cheaply than any other alternative that meets all our policy criteria.

3.2 Residential Buildings

3.2.1 Domestic buildings account for 27% of UK emissions. Making Britain's buildings energy efficient would cut energy use and carbon emissions and pay back handsomely in reduced energy costs, the creation of thousands of new jobs and by cutting the £1 billion a year costs to health and social services caused by cold and damp housing.

3.2.2 Liberal Democrats in Government are tightening energy efficiency standards for new homes, which will lead to nearly all new homes being zero carbon from 2016. We are also investigating how to facilitate 'allowable solutions', under which developers can find economical ways to compensate for the CO₂ emissions reductions that are difficult to achieve through normal design and construction.

3.2.3 However, studies repeatedly show that fewer than half of new houses in practice actually meet the required standards and there is no record of anyone being prosecuted for failing to meet them. Liberal Democrats would step up random testing of new homes' energy performance, requiring those builders who have cut corners not just to rectify their omissions, but to include extra energy saving measures as a penalty to compensate householders too. When a

building firm can show that it is regularly meeting the standard, the frequency of testing should be reduced to the very occasional.

3.2.4 We would develop business and technical support for 'factory built' cores manufactured off-site, as there is evidence they can deliver more energy efficient homes.

3.2.5 A bigger challenge is the appalling energy performance of most existing homes. This is the main cause of fuel poverty, and a major contributor to carbon emissions. Our long-term objective is to bring all homes up to the Passivhaus standard commonly used elsewhere in Europe, where homes need almost no space heat other than that generated by appliances.

3.2.6 The Green Deal should provide 'whole-house' retrofitting. But if at first only limited improvements are made, it becomes more difficult to bring existing homes up to the standard needed to meet the UK's carbon reduction targets, because subsequent improvements may be made less economic and householders may be unwilling to put up with a second round of disruption.

3.2.7 Liberal Democrats would transform the Green Deal into a comprehensive one-off programme to bring all homes up to the EnerPHit standard by 2050. The EnerPHit standard is a reduced version of the Passivhaus standard that recognises the challenges of upgrading older properties but uses Passivhaus components to provide quality assurance and verify energy performance. Such a programme would require considerable investment. We would, therefore, focus initially on two key areas: households suffering from fuel poverty and homes in off-gas areas. The total investment would be lower than that required to finance the equivalent generating capacity. We would also extend Green Deal Finance schemes to homes between lets, and homes in multiple occupation.

3.2.8 Liberal Democrats would encourage investment in energy efficiency by offering differential final stamp duty rates on home transactions. Householders who, after purchase, improved the EPC ratings by investing in sufficient energy efficiency measures would receive a rebate. The rate of stamp duty would in effect be higher for those purchasers who after two years of occupancy had failed to make improvements. This differential, designed so as to make the scheme revenue neutral, would widen over the years. We would consider using regulations to require mortgage lenders to ensure that a building meets EnerPHit standards when making new loans. Such a measure may combine mortgage lending and Green Deal finance.

3.2.9 To encourage non-movers to invest in energy efficiency, we would encourage local authorities to reduce tax rates for those who could demonstrate significant improvements in a home's EPC ratings. We would also permit local authorities to introduce tax surcharges on those householders who failed to take up improvements, especially those that met the Green Deal Golden Rule requirements.

3.2.10 Liberal Democrats would increase both the visibility and the reliability of the A+++ to G Energy Performance Certificates, which are needed whenever a building changes ownership or occupants. Estate agents would need to show ratings on all promotional material, whether in windows, on-line or press advertisements. The estimated long-term running costs of each building should be made part of the process. We would also use random checking to ensure compliance and accuracy.

3.2.11 Extending or altering buildings can cause an increase in the amount of energy used. Liberal Democrats would require, as a condition of permission, consequential improvements that enable the existing property to meet a proportionate level of energy efficiency standards, delivered in a cost effective way.

3.2.12 Liberal Democrats in Government are funding a construction industry scheme aimed at closing the gap between the energy standards new homes are designed to and the way they perform when built. We would continue to work with the manufacturing and construction industry to improve the energy efficiency performance of homes.

3.2.13 The rental sector contains some of the most, but also some of the least, energy efficient properties. Liberal Democrats in Government have outlawed rental of F or G rated buildings, and will raise standards over the next decade. We would expand publicity for the Landlords Energy Saving Allowance, to increase take up.

3.2.14 Many energy-conserving items are taxed for VAT at the reduced 5% rate, the same as for energy consumption. The European Commission is prosecuting the UK government for this concession. The UK Government should fight this unnecessary intervention, which would quadruple the VAT rate on measures like insulation, heating controls and microgeneration, and damage the viability of the Green Deal by reducing payback levels possible under the Golden Rule.

3.3 Commercial, Services and Public Sector Buildings

3.3.1 The commercial, services and public sectors occupy buildings responsible today for 17% of UK carbon emissions. Energy standards for new non-residential buildings are being improved, so that all will be required to be zero carbon by 2019. There is evidence of serious non-compliance, especially when buildings are speculatively constructed for lease. Liberal Democrats would ensure regular inspections and monitoring both before and after completion, with tough penalties for deliberate non-compliance.

3.3.2 Liberal Democrats in Government have outlawed the letting of the most inefficient commercial buildings (F and G rated). Although it is not mandatory until 2018, this measure is already increasing the value differential between energy efficient and gas guzzling buildings. Giving appropriate notice, Liberal Democrats would tighten standards, to cover the letting of E and D buildings. Our long term aim, as for domestic buildings is for all commercial and public buildings to achieve EnerPHit standards by 2050.

3.3.3 Liberal Democrats would seek to improve compliance with the Offices, Shops and Railway Premises Act 1963 regarding both minimum and maximum temperature levels. We want to discourage contravention by retailers who deliberately leave open doors in winter, or leave chiller or freezer compartments open.

3.3.4 The introduction of annual Display Energy Certificates (DECs) in prominent places in public sector buildings is revolutionising the public sector estate, by increasing awareness of relevant performance. But around half the public estate is still not compliant. Liberal Democrats would ensure full compliance in all relevant public buildings and publish these on a single web portal. We would also incentivise energy efficiency across the public sector by permitting 50% of money saved to be retained by the relevant division. Heeding calls from many in the property industry, we would expand the DEC scheme to cover larger private sector buildings.

3.4 Business and Energy Saving

3.4.1 There has been a dearth of policies aimed at helping the nearly 2 million small and medium-sized enterprises (SMEs) save energy. A Carbon Trust loan scheme now operated by Siemens Finance, offers commercial rates of interest. When we were part of Government in Scotland, Liberal Democrats brought in a zero interest loan scheme to provide small unsecured loans of up to £50,000 with minimum bureaucracy to established SMEs for recognised energy saving installations. The loan is paid back into a revolving fund from savings on the energy bills after five years. The capital is then loaned out to other potential beneficiaries. We would seek to extend the zero interest loan scheme across Britain, and extend its scope to include on-site renewables.

3.4.2 The Energy Efficiency Directive (EED) requires all companies employing over 250 people to have entire energy audits of all their activities every four years. We would ensure that companies publish the results of these audits, and are incentivised to introduce all the cost-effective options between audits.

3.5 Consumers and Energy Saving

3.5.1 There has been considerable success at EU level in improving the energy efficiency of domestic appliances through the EU-wide labelling scheme, which rapidly eliminated poor performing appliances from the market. However, the scheme now needs improving. Liberal Democrats propose:

- Including on the energy label an estimate of the lifetime energy cost of running the appliance.
- Improving energy labelling standards, preferably by introducing automatic updating for the performance achieved by the best products on the market, thus ensuring ever-increasing efficiency gains whilst giving manufacturers a stable standards regime.
- Extending the EU energy labelling scheme to the widest possible number of energy intensive products.

3.5.2 We would also work with distributors and retailers to ensure greater prominence is given to this information.

3.5.3 There is potential for smarter use of energy by households. Households can maximise the use of electricity by prioritising flexible, or semi-flexible, electricity demands according to urgency or by enabling non-time-sensitive equipment to switch on when power is available. High energy using appliances like cookers and kettles can be designed with two levels of heating elements to select, based on the best match to the power available. We would:

- Work with manufacturers to develop standard protocols for white goods to communicate through smart meters with electricity suppliers and National Grid.
- Work with Ofgem and electricity suppliers to develop load-shedding/deferring tariffs for customers, who have intelligent meters and smart white goods.

3.5.4 Liberal Democrats would take further measures to encourage people to pay greater attention to the way they use energy, enabling them to save them money and help protect the environment. We would ensure that:

- Wherever the selling price for a car or a home is given, prominence is given to annual and lifetime energy costs calculated on a standard basis.
- Controls and appliances, which require user understanding to operate efficiently, are accompanied by a simple, easily understood instruction manual that meets a new standard that we will ask the BSI to produce.
- All cars would be required to be fitted with energy efficiency gauges.

3.6 Heating and Air Conditioning

3.6.1 In future, erratic weather may reduce the need for winter heating but should temperatures rise, there is an increased risk that the need for air conditioning will lead to a significant rise in summer energy use. Liberal Democrats would:

- Amend the Code for Sustainable Homes, BREEAM and other relevant standards to ensure that new buildings are designed to minimise any need for air conditioning.
- Review planning guidance to reflect the important role that green and 'blue' (water) spaces and large trees have in countering the heat island effect in urban areas.

Decarbonising Electricity

4.1 The Case for Decarbonisation

4.1.1 The UK currently uses around 318 TWh of electricity per annum, which results in 145 million tonnes of carbon dioxide (CO₂) annually, or 32% of the UK's total CO₂ emissions.

4.1.2 By 2050, the UK will be using electricity more widely than at present. There is expected to be a larger population, many more electric road vehicles, more electric trains and greater use of electric heat pumps. Even though Liberal Democrats will prioritise using all forms of energy more efficiently, the level of demand for electricity will remain significant and could increase.

4.1.3 The Committee on Climate Change has advised the UK Government to take action to decarbonise electricity completely by 2030 in order to stay on a cost-effective trajectory to achieving the 2050 climate change goals. Heating and transport, the two other major contributors to UK emissions, are more difficult and expensive to decarbonise.

4.1.4 Decarbonising the electricity sector is, therefore, an immense and pressing challenge. Over the next decade, the UK will need to invest in new generation capacity to replace the coal and nuclear power stations set to close by the early 2020s – representing around a fifth of current capacity – in order to maintain energy security and deliver the legally binding carbon budgets.

4.1.5 Liberal Democrats seek to greatly increase the role of low carbon sources in the electricity mix, so that by 2050 they meet all the UK's electricity demand. During the transition, competition between the low carbon sources should drive innovation and lower costs. We would:

- Promote renewable energy and other low carbon measures, including by, as soon as possible, introducing a legally binding target for the decarbonisation of the electricity sector by 2030, in the range of 50-100g of CO₂ per kWh of electricity, to provide certainty to investors in the clean electricity sector.
- Manage electricity demand more effectively by making greater use of international interconnection to balance the electricity demand and supply (see Section 4.6).
- Increase distributed generation, i.e. place small to medium sized generation assets close to centres of demand to reduce transmission and distribution losses and enable wider and more efficient use of Combined Heat and Power (CHP).
- Investigate the development of a larger UK energy storage market for the UK, including a price for energy storage, and contracting and payment mechanisms.

4.2 Renewables

4.2.1 The UK has enormous potential for developing renewable sources of energy, particularly through wind and marine renewables. Neglected by Conservative and Labour governments alike in the past, the industry is now growing quickly under the impact of the EU 2020 target – helping to cut emissions and reduce fossil fuel imports while at the same time creating jobs and export opportunities. Analyses for the Committee on Climate Change have included scenarios for up to 65 per cent electricity generated from renewables by 2030.

4.2.2 As gas prices increase, many renewable technologies should become steadily more cost-competitive. The issue is not potential, but delivery and diversity. Liberal Democrats aim to construct a complete market and planning framework providing sufficient incentives to invest in clean energy compared to the risks and costs. Measures applicable to all renewable technologies would include:

- Creating an open and competitive electricity market, reversing the deterioration in the route to market for independent and community renewable generators, and clearing obstacles that currently limit the role that small suppliers play.
- Promoting technology and innovation development, for example through universities, the Energy Technology Institute and Technology Strategy Board.
- Providing support for new technologies (like marine) or business models (like community investment or the development of Energy Services Companies) through the Green Investment Bank.
- Reducing planning barriers by reforming planning policy, and ensuring that renewables are a priority in the definition of 'sustainable development' in the National Planning Policy Framework.

4.2.3 Energy storage, if distributed through the network on an economic basis, could increase the capacity of the grid to accept new generation; energy generated at peak times can be stored, and then transmitted at other times.

4.2.4 The EU's 2020 renewables target has undoubtedly helped to stimulate the industry, at the cost of introducing some distortions, such as excessive substantial short-term reliance on biomass. We would prefer to see the EU adopt a similar approach to that of the Climate Change Act, with binding greenhouse gas emission targets for the EU and its member states, rather than separate emissions and renewables targets. If this proves impractical, however, we would not oppose a 2030 EU renewables target.

4.2.5 Onshore wind, currently the cheapest renewable technology, could provide up to a fifth of UK electricity consumption. In public opinion surveys wind farms consistently attract support from around two-thirds of the public, but the 10 per cent or so who are consistently opposed are usually more vocal. Liberal Democrats would require onshore wind farms to help fund local energy efficiency measures, thus reducing householders' energy bills. Liberal Democrats would support developers who seek punitive damages against councils who do not follow National Policy Guidelines in determining consents, for example, many (particularly Conservative) councils have adopted criteria (such as minimum separation distances from dwellings), in contravention of government planning policy.

4.2.6 The UK currently has more *offshore wind* installed than any other country, and the technology could provide all UK consumption, but costs are increasing as projects move further offshore, and available installation resources are stretched. It has become a 'large company' technology and needs more diversity in investment. We would encourage offshore wind through pension fund investment via the tax system, and support from the Green Investment Bank.

4.2.7 Solar photovoltaic (both roof-mounted and ground-mounted) is growing most rapidly of all renewable technologies, thanks to very significant cost reductions, and could achieve 20–30 GW of capacity, providing up to a third of UK demand. It currently has the highest level of financial support of all renewable technologies, though this is steadily falling. It is a technology well suited to widespread community-scale investment, supported by EIS tax incentives. For larger installations on farmland, dual land use needs to be ensured.

4.2.8 Marine renewables could provide more than a third of UK electricity. Wave devices could generate around 11 per cent of current consumption. Tidal technologies include both tidal barrages and lagoons (smaller versions of barrages, within rather than across estuaries), and tidal flow devices which are like underwater wind turbines. Significant cost reductions are expected, especially in tidal flow, which would make it cost-competitive with offshore wind by 2020. For all the marine renewables, there is a risk of lock-in to first-generation technologies and providers, and to a few large energy companies. To deliver a more diverse range of technologies and smaller providers, we would reform the licensing system run by the Crown Estate, and give the Green Investment Bank a remit to create diversity. Universities, the TSB and ETI need to focus on developing second-generation technologies to reduce costs.

4.2.9 The use of biomass, mainly wood, for electricity generation will be key to the UK to meet its 2020 renewables target, but burning biomass generates carbon emissions and it also converts poorly to electricity; its use should be strictly limited. We support the government's cap on new dedicated biomass plants, and believe support for all new biomass for electricity generation should end in 2020. There is, however, substantial scope for the use of biomass in heat technologies; this is considered in Chapter 5.

4.2.10 Energy from waste (both burned directly and processed to a gas) could provide a significant portion (15–20 per cent) of UK electricity or transport applications. Producing energy from such wastes is a much better option than generating energy from crops or woodland products, which have a more important role to play in carbon sequestration (see Chapter 8).

4.2.11 Whilst combined heat and power (CHP) is not a renewable technology, it has an important role to play in decarbonising electricity generation. We would not allow new gas-fired generation without a clear plan to recover heat for supply to industrial or commercial consumers or via a heat network.

4.3 Nuclear

4.3.1 Around 19% of the UK's electricity generation is currently from nuclear power. However, all but one of the existing nuclear power stations is currently expected to close by 2023. In order to facilitate the construction of new nuclear plant, the Government has introduced the Generic Design Assessment process and made changes to the planning system for nationally significant infrastructure projects (including nuclear power stations). The Energy Bill - before Parliament at the time of writing - will introduce a new system of long-term contracts for low-carbon electricity generators, which are intended to bring forward new investment in these projects.

4.3.2 The industry has set out plans to develop up to 16GW of nuclear power in the UK by 2025.

Option A

4.3.3 Liberal Democrats remain opposed to building a new generation of nuclear power stations. There is still no effective solution for the long-term storage and disposal of the radioactive waste inherent in nuclear generation and it is far from clear that nuclear power is viable without public subsidy, particularly if the total costs of a potential accident are taken into account. Nuclear power is a more expensive way of reducing carbon emissions than promoting many renewable energy sources.

4.3.4 Moreover, allowing nuclear new build risks seriously distorting the UK electricity market for decades to come, reducing the competitiveness of British businesses and diverting resources from environmentally sustainable forms of energy such as renewables.

Option B

4.3.3 Liberal Democrats recognise that the achievement of a zero carbon Britain would require an enormous effort. We accept that in future, nuclear power stations, as an established low carbon source of electricity, could play a limited role in decarbonising the UK's electricity supply and reducing the country's dependence on fossil fuel imports, provided concerns about safety, disposal of radioactive waste and cost (including decommissioning) can be adequately addressed.

4.3.4 Liberal Democrats insist that it must be up to the industry to finance the full life span of new nuclear power plant from construction to decommissioning and disposal of waste. We will not allow any public subsidy for new nuclear build.

4.4 Gas

4.4.1 In view of its flexibility and relatively low carbon intensity, gas will continue to have a role in the UK energy mix, at least in the short to medium term, particularly as a fuel for domestic and commercial space heating and CHP schemes. However, natural gas is a fossil fuel that emits CO₂ so its continued use will need to be constrained and ultimately we believe these roles should be superseded by improved building insulation standards, electrically driven heat pumps and carbon neutral biogas.

4.4.2 Liberal Democrats fully endorse the view of the Committee on Climate Change that the extensive use of unabated gas-fired capacity (i.e. without carbon capture and storage technology) in 2030 and beyond would be incompatible with meeting the UK's legally binding carbon budgets. The role of gas should be increasingly confined to heating rather than electricity generation in order to maximise its final energy output. Our proposed statutory decarbonisation target for 2030 would significantly reduce the share of electricity generation from unabated gas. Our proposals for promoting combined heat and power (CHP) are set out in Sections 4.1.5 and 4.2.11.

4.4.3 This is a very different approach to that advocated by the Chancellor, which would increase the UK's reliance on gas, and particularly on unconventional sources, i.e. shale gas. In recent years shale gas production has transformed the energy market in the US, though at the cost of significant local environmental damage and pollution of water tables. However, UK geology is much less favourable than that of the US (the shale contains a much higher proportion of clay, rendering hydraulic fracturing, or 'fracking', techniques, much less viable), and, also unlike in the US, the benefits of production will accrue to the government, not to the land-owner – thus increasing the likelihood of local opposition. There is no realistic prospect, therefore, of a 'shale gas revolution' in the UK.

4.4.4 Still, there is value in promoting domestic production rather than imports, so Liberal Democrats would permit measured shale gas extraction, ensuring that regulations protecting water and land pollution and local environmental quality are strictly enforced at a national level. Planning permission decisions should remain with local authorities however, and local communities should be fully consulted over local extraction, and fully compensated for all damage to the local landscape.

4.5 Carbon Capture and Storage

4.5.1 Carbon capture and storage (CCS) involves capturing carbon dioxide (CO₂) emitted from large sources such as fossil fuel power stations, transporting it, and then storing it in secure geological formations deep underground. CCS can turn high carbon fuels into low carbon electricity. It provides a unique opportunity to keep fossil fuels (coal and gas) in the UK's electricity supply mix while reducing carbon dioxide emissions. CCS could, therefore, contribute to decarbonising power generation and energy intensive industries. But there are only eight large-scale integrated CCS projects globally and no CCS electricity generation demonstration projects at commercial scale anywhere.

4.5.2 Liberal Democrats want to see the timely deployment of commercially viable CCS. We would encourage the development of CCS technology centres or hubs in strategic regions of the UK and continue the programme of commercialisation of CCS by providing funding for a further two CCS demonstration projects, after which time it is to be expected that CCS can rely on normal mechanisms of support for low carbon power generation. The use of gas (and coal) on a large scale after 2030 should be conditional upon it being fitted with effective CCS technology.

4.6 Balancing the Electricity System

4.6.1 A higher penetration of variable generation technologies such as renewables, e.g. wind and solar, requires more flexible management of the electricity grid. There are a number of credible solutions to deliver a fully reliable electricity supply in a renewable energy system. They include increased interconnection to other national grids and cross-border trade in electricity, smart grid technology to enhance demand side management, electricity storage solutions and flexible gas plant.

4.6.2 Demand side management is an effective solution to help with short term balancing of renewables and to shave supply peaks. The new EU Energy Efficiency Directive introduces a number of requirements to kick-start demand side programmes across Europe. We are committed to putting those into practice in the coming years, building on the Liberal Democrat achievements of introducing demand side response and electricity demand reduction in the reform of the electricity market.

4.6.3 Interconnection to the wider European electricity market would enable the UK to buy and sell electricity in times of shortage and surplus. The UK still has very limited links to other countries' grids: current interconnection capacity is 3.5GW, or less than half of the EU target of at least 10% of installed generation capacity. Interconnection to countries such as Norway would also offer special advantages, as it would open up access to their huge electricity storage capabilities.

4.6.4 Liberal Democrats would therefore prioritise building more interconnection as a reliable, cost-effective and clean solution to balancing renewables. We would cooperate with the UK's European partners, such as Norway, Iceland, Ireland and Denmark, in order to launch more interconnector projects to be completed by 2030.

4.7 Energy Market Reform

4.7.1 Delivering a zero carbon Britain will require the creation of a more diverse energy market of smaller energy generators and suppliers. Liberal Democrats would seek to reform the energy supply market, away from centralised solutions to a host of embedded renewable energy generation.

4.7.2 Our aspiration would be that half of households and businesses should have the opportunity to generate some form of renewable energy within the next two decades. This could include owning renewables on their own building, or owning a share in a community project. If people have a stake in the renewable energy revolution, they will have greater technical and market knowledge and more ability to hold Government, incumbent firms, planners and regulators to account. Liberal Democrats would:

- Ensure that there is a vibrant market in direct selling of renewable power (and associated certificates like Renewables Obligations Certificates (ROCs), or Levy Exemption certificates) from those with power to sell, and the purchase of power by those wanting to buy.
- Work with Ofgem, generators and consumers to investigate how to make a bilateral energy and carbon market function as effectively as possible.
- Enable renewable energy schemes to sell direct to householders with the minimum of regulatory interference and the minimum of system charges.
- Build a large and dynamic energy services market (providing both expertise and off balance sheet finance), by using the Green Investment Bank to support new entrants to the energy services market.
- Encourage commercial landlords and tenants to refurbish leased properties through reform of commercial leases and reform Feed-in tariffs so that commercial scale projects give higher returns over a shorter period, to more easily fit with existing lease lifetimes.

4.8 Promoting Community Energy

4.8.1 Liberal Democrats would encourage the involvement of local authorities, community groups and individuals in renewable energy and energy conservation projects. Engaging local communities would introduce more competition into the energy supply market and help to overcome local opposition to clean energy technologies, such as wind farms. We would:

- Provide a model legal and business framework for Community-Owned Renewable Energy

Co-operatives, to reduce the legal costs and complexity for communities wishing to establish their own.

- Provide such co-operatives with start-up capital from the Green Investment Bank for community-owned small-scale power and heat generation schemes with a credible business and environmental case and encourage local investment through the provision of a tax-free ISA equivalent.
- Enable local energy co-operatives to supply their own residents or local wholesalers.
- Work to ensure there are no barriers to connection to appropriate networks, nor to sale or purchase at a competitive price.
- Review the Feed-in Tariff and Renewable Heat Incentive schemes, to improve support for community-owned renewables.
- Give local communities the right to purchase a certain minimum portion of any wind or solar project larger than 1 MW proposed within their area.
- Give community co-operatives the right to develop renewable energy projects (including, but not limited to, solar) in or on suitable publicly owned buildings, and publicly owned land, where practicable.

Heat

5.0.1 Heating accounts for nearly half of total UK CO₂ emissions. Decarbonisation of the heat supply is, therefore, a crucial step to achieving a Zero Carbon Britain. Liberal Democrats in Government have introduced a Heat Strategy that calls for heating to be carbon free by 2050.

5.0.2 Our first priority is to decrease the demand for heating through an ambitious energy efficiency programme in buildings.

5.1 Integrating Heat and Power

5.1.1 UK electricity generation is notoriously inefficient, with even the best gas-fired power-only stations achieving just over 50% (gross) efficiency and with coal- and oil-fired power-only stations generally below 40%. Denmark has shown how this can be dramatically improved by only permitting new power stations that have a guaranteed use for their waste heat. As a result, Danish gas-fired stations achieve efficiencies in excess of 80%. Liberal Democrats would require as a DECC planning condition that new UK fossil fuelled power stations are connected to a guaranteed use for their waste heat.

5.1.2 Industrial, commercial and agricultural heat users are manifold, and can be co-located with new fossil fuel generation in the range of 5-100MW to maximise recovery of heat.

5.1.3 For areas of high density, such as the centre of cities and towns, and areas with a large percentage of old buildings which can be difficult to retrofit, district heating can reduce carbon emissions and reducing heating costs. Large district heating networks (and district cooling networks) can use heat from multiple sources, including waste industrial heat, combined heat and power and biomass.

5.1.4 Many UK local authorities are actively pursuing the creation of community-scale district heating. The only way for district heating to compete at scale with the incumbent gas network is to reduce the cost of borrowing to utility rates of interest. Liberal Democrats would enable local authorities to zone areas where district heating should provide the heating for existing buildings, instead of gas, after a set date, and provide state bonds or support from the GIB for the capital required. Ofgem has a role in developing the market for third party connections, for example encouraging competition in connections.

5.2 Biomass

5.2.1 Biomass, particularly wood, converts efficiently to heat but rather poorly to electricity; it is most efficiently used when delivering both. Liberal Democrats believe that biomass supplies should be developed for heating rather than electricity generation alone. Furthermore, thanks to its bulk and the dispersed nature of its supply, biomass lends itself most readily to smaller scale biomass and woodfuel boilers suited to domestic and industrial use, using material derived from the local landscape, such as arisings from trees, hedgerows, roadside management, woods, coppices and habitat management for biodiversity conservation. From 2020 support from the Renewable Heat Incentive should be given only to these kinds of supplies, though support for larger scale installations will be necessary in the short term to meet the UK's EU renewables target.

5.2.2 Alternatives to wood for biomass heat include organic waste, agricultural residues and domestic energy crops, such as miscanthus, reed canary grass and switchgrass; these could play an important role, as long as food production is not unduly affected. Government should provide support for the development and commercialisation of these sources, and also regulate to end the disposal of organic waste in landfill.

5.3 Low Carbon Gas

5.3.1 There are several means of producing gas that has a lower carbon content than natural gas including gasification, pyrolysis and anaerobic digestion. Some of these gases can be used on site in industrial processes. Others can be exported to the gas network.

5.3.2 Anaerobic digestion (AD) is a natural process through which micro-organisms break down the organic matter in biomass waste such as sewage sludge, animal manure and waste food to produce biogas; this can be burned directly in a gas boiler to produce heat or in a CHP unit to produce heat and electricity, or (after cleaning) injected into the national gas grid to be used in the same way as natural gas, or used as a vehicle fuel. The potential market for AD is substantial; around half of residential gas demand could come from biogas. However, the market for AD has not so far taken off. Liberal Democrats would:

- Set a target for the carbon content of gas which is lower than current carbon content.
- Phase out organic waste to landfill.
- Review Feed-in Tariffs and the Renewable Heat Incentive, together with exploring the lending market and the role of the GIB, with a view to encouraging a major uptake of use of low carbon gas onsite or injection to the gas network.

5.3.3 Ofgem has a role in facilitating connections to the gas network in the same way that renewables have connected to the electrical network through, for example, Long Term Development Statements, and developing competition in connections for gas.

Decarbonising Transport

6.0.1 The transport sector is responsible for 24% of the UK's carbon emissions, and is the only one where energy intensity has increased since 1970. There is considerable potential for improved energy efficiency in transport, and action is needed to encourage people to switch to lower emission fuels and modes.

6.0.2 This sector also presents many opportunities for green growth and job creation through the development of the next generation of fuel-efficient and alternative energy transport technologies, and also through the expansion of low carbon transport networks. The UK is already emerging as a world leader on the production of low carbon automotive technology, and as a result became a net exporter of cars in 2012 for the first time since 1976.

6.0.3 A shift towards other low carbon transport modes is also needed. Liberal Democrats in Government have set up the £600m Local Sustainable Transport Fund (LSTF) to fund local transport projects which promote economic growth, reduce emissions, and make local transport more convenient and more affordable. The 2011-15 LSTF is driving the creation of over 22,000 jobs, and is forecast to deliver emissions reductions of 7m tonnes CO₂ over the next 15 years.

6.1 Changing Behaviours

6.1.1 The most energy efficient forms of transport are active transport - walking and cycling. As well as being environmentally beneficial, they are low cost and good for public health. However, the UK's rates of walking and cycling are still substantially below many other European countries. Liberal Democrats aim to achieve the highest growth rate of cycle use per capita in the OECD, through the promotion of cycle hire schemes and safe lanes in our towns and cities.

6.1.2 Liberal Democrats would:

- Introduce a statutory requirement that cyclists' and pedestrians' needs are considered as part of any new transport and infrastructure development projects, and would encourage the creation of secure cycle storage facilities (like at Leeds Station) at all major UK stations.
- Make walking and cycling safer and more appealing. We would bring in a presumption of liability for motorists involved in traffic accidents much like the systems already operated in many other European countries, where the less vulnerable driver is deemed at fault unless proved otherwise.
- Introduce a 20 mph standard speed limit for residential streets.
- Require all schools to provide level 1 and 2 Bikeability (cycling proficiency) training for pupils who want it.

6.1.3 Liberal Democrats would work to increase bus patronage and encourage the use of more fuel-efficient buses. The UK's bus network is the backbone of our public transport system; nearly two-thirds of all public transport trips are made on buses. Buses have enormous economic, social and environmental value. They reduce congestion, lower overall emissions, and provide access to jobs, services and education.

6.1.4 Bus services are subsidised in order to make marginal services commercially viable. The subsidy has been provided through the Bus Service Operators Grant (BSOG) at a flat rate based on fuel use, which acts as a disincentive for operators to reduce emissions or use more efficient buses. Liberal Democrats in Government have devolved the BSOG to local authorities to give communities more control over how the money is spent, and introduced a low carbon emission incentive on a trial basis.

6.1.5 We would further reform the BSOG to make it payable on a per-km basis in order to remove the disincentive for operators to use more efficient vehicles, and would make the low carbon emission incentive a permanent feature, in order to accelerate the uptake of electric or fuel cell buses. We would provide more support to bus operators and local authorities for improving and expanding bus services and, building on the success of the LSTF, expand the support for measures aimed at influencing people's travel behaviour towards more sustainable options.

6.1.6 Liberal Democrats would make preparations for the introduction of a system of road pricing and where appropriate, support local authorities seeking to bring in road pricing in congested areas. Road pricing would ensure motorists are only charged for journeys they make, with the rates calculated based on distances travelled and the emissions of vehicles. Any such system would be revenue neutral for motorists, with revenue from cars used to abolish Vehicle Excise Duty and reduce fuel duty, helping those in rural areas who have no alternatives to road travel. We would levy different rates in cities and sparsely populated areas order to recognise the lack of transport alternatives in many parts of the country. Different rates could be set at certain points of the day in order to reduce congestion at peak times.

6.1.7 We would also amend the driving test to include a section on fuel-efficient driving techniques.

6.2 Private Vehicles

6.2.1 The achievement of a zero carbon Britain will require the development of a low emission national car fleet. Given that the average lifetime of a car in the UK is 13.5 years, such a change will take significant time. Motorists, the automotive industry, and the scientists and researchers investigating low carbon transport all need as much long term certainty as possible as to the direction of government policy. Liberal Democrats would specify that by 2040, only ultra-low carbon vehicles will be permitted on UK roads for non-freight purposes. If technology permitted, we would bring forward this date. Committing to the decarbonisation of tail pipe emissions in this way will boost domestic demand and give the UK a leadership role in ultra-low-carbon vehicles, driving UK-based investment in research and development by the automotive industry.

6.2.2 Liberal Democrats support the EU targets for 2015 and 2020 on the emissions of new cars. Automotive manufacturers initially opposed proposals to tighten EU vehicle emissions targets. However, such concerns have proved to be unfounded, and manufacturers are on track to meet targets of 130g CO₂/km by 2015 and 95g CO₂/km by 2020. In the UK, fleet average emissions for new cars have fallen by nearly a third over the last decade as result of more fuel efficient engines, electrification and use of biofuels and fuel cells. The application of these targets has driven the development of the low carbon technology which has revived the UK car industry.

6.2.3 Liberal Democrats support setting further ambitious interim emissions targets for cars of around 70g CO₂/km to take effect in 2025. We also support tightening emissions targets for vans,

which at 147g CO₂/km by 2020 are currently far too loose compared to the equivalent target for cars.

6.2.4 Alongside appropriate EU emissions targets, we would develop a Vehicle Excise Duty (VED) escalator linked to the targets into the 2020s, to drive down car emissions and provide certainty for consumers and manufacturers alike. This could include a subsidy for the cleanest vehicles, paid for by VED on the highest emission vehicles.

6.2.5 According to the European Commission, however, around a fifth of the claimed reduction in emissions is currently a result of car makers manipulating the test procedures rather than improved technology. Liberal Democrats propose independent in-service testing on a representative sample of cars, as occurs in the US.

6.2.6 It is not only vehicles that contribute to the transport sector's emissions however. We would also set a timetable for replacing all old street lights with energy efficient lamps and smart control systems to allow dimming where appropriate.

6.3 Rail

6.3.1 Rail has significant potential to reduce overall total emissions from the transport sector. Electric trains in particular are faster, cleaner, and have lower running costs than diesel trains.

6.3.2 Liberal Democrats in Government are overseeing the largest expansion in rail since the Victorian era, committing to over £18bn of investment including Crossrail and HS2 by March 2015. Liberal Democrats support the construction of the HS2 route to the north of England, as the additional capacity it will provide on the rail network will attract passengers from the roads and air travel, and is a much greener option than expansion of road or airport capacity. For this reason we also support re-opening and expanding rail lines and stations wherever there are clear economic and environmental benefits, including to attract more passengers and freight off the roads and onto rail.

6.3.3 Liberal Democrats in Government have committed to the electrification of over 800 miles of railway (compared to 9 miles under Labour), which once complete will ensure that three quarters of all rail journeys in England and Wales will be made on electric trains. We would continue to extend electrification of the rail network as far and as fast as possible, particularly on high-use lines, wherever there are clear economic and environmental benefits of doing so.

6.4 Aviation and Shipping

6.4.1 Emissions from aviation are forecast to contribute an increasing proportion of the UK's total emissions. Whilst emissions from other sectors are forecast to decrease up until 2050, on current trends growth in aviation will result in increased emissions.

6.4.2 Currently air travel does not attract VAT, and fuel used by airlines is not taxed. The only duty levied is Air Passenger Duty (APD). Liberal Democrats would like to see APD replaced with a per plane duty, charged in proportion to the carbon emissions created by that journey. A per plane duty would immediately create an incentive for airlines to use more fuel-efficient planes and to use them at higher occupancy levels (and potentially at reduced frequency). International agreements currently prevent moving to a per plane duty, but we would work with international governments and the airline industry to bring about the necessary reform. As a general principle we would seek to equalise the tax in terms of cost per tonne of carbon across transport sectors; taxation of aviation is currently well below that for other sectors.

6.4.3 Some 90% of the world's international trade is by sea, and the industry accounts for three to four percent of global CO₂ emissions, yet currently, much like aviation, fuel used for shipping is essentially untaxed. Liberal Democrats would therefore seek to reach international agreement on a system that would incentivise the shipping industry to maximise fuel efficiency, building on existing initiatives such as the International Maritime Organisation's new Energy Efficiency Design Index for new ships. We believe that market solutions are a powerful tool that can be used to drive behaviour, and therefore we propose to include emissions from the shipping industry in the EU ETS scheme (much as aviation has been included as of 1 Jan 2012). Port landing charges should also be varied by the greenhouse gas emissions levels of the ship, extending the current Environmental Ships Index scheme, which covers other pollutants.

6.4.4 Liberal Democrats would include international aviation and shipping emissions in the UK's statutory targets to reduce emissions and the carbon budget framework. The aim of the Climate Change Act is to demonstrate British leadership in the international effort to avoid dangerous levels of greenhouse emissions. If aviation and shipping emissions remain excluded, the overall target reduction for all other sectors would need to be increased.

6.5 Transport Biofuels

6.5.1 Recent years have seen a dramatic expansion in the market for transport biofuels, including biodiesel produced from palm oil, rapeseed or soybean oil, and ethanol produced from corn, wheat, sugar cane or sugar beet.

6.5.2 The EU Renewable Energy Directive sets each member state a target of a minimum 10 per cent for renewable energy in transport by 2020. Sustainability criteria are meant to ensure that the biofuels used towards this target deliver significant greenhouse gas savings compared to the fossil fuels they replace, and do not, for example, lead to deforestation – but at present these criteria do not take account of the impacts of indirect land use change (ILUC), for example deforestation caused by food production displaced by oil palm plantations. Recent research has suggested that once these ILUC factors are taken into account, biofuels produced from vegetable oils in fact generate higher carbon emissions than fossil fuels.

6.5.3 In addition, food crop-based biofuels generally displace food crops, pushing up both the level and the volatility of food prices. The policy has also proved highly expensive, currently

costing the EU about €10 billion a year in tax breaks and higher fuel bills. If the same amount were spent directly on improvements to vehicle technology, greater reductions in emissions could be achieved, while at the same time cutting motorists' bills. The European Commission is currently proposing to cap the volume of biofuels from food crops at 5 per cent, opening up more of the market to non-food-crop-based biofuels, from algae, waste and residues (though many of these technologies are in their infancy), and also introduce ILUC factors for biofuel use, though only for reporting, not for compliance with the targets.

6.5.4 This combination of policies has created a costly system for increasing greenhouse gas emissions while simultaneously disrupting global food markets. Liberal Democrats support the Commission's proposal for an immediate 5 per cent cap on biofuels derived from food crops, and also believe that ILUC factors should be incorporated in the current policy for compliance purposes, not merely for reporting. This would make some biofuels ineligible for subsidy and would mean they could not be counted towards the 10 per cent target. After 2020 we believe that all support for food-crop-based biofuels should be ended; subsidies should be limited to biofuels derived entirely from non-food-crop sources.

Tackling Emissions from Industry

7.1 Emissions from industry accounted for around a third of UK greenhouse gas emissions in 2012. Around 80% of industry emissions are CO₂, of which around 70% are directly due to the burning of fossil fuels and chemical processes, and 30% arise indirectly from the use of electricity. Switching from fossil fuel-based heating systems to electric heating will reduce emissions as UK electricity generation is steadily decarbonised. In the longer term, CCS technology will be essential in reducing emissions from industrial processes, and some of the government support for CCS should be devoted to this aim.

7.2 Energy-intensive industries, such as iron, steel, aluminium and paper, will be particularly affected by the EU ETS and the carbon floor price (see Sections 2.3 and 2.4), which together may cause 'carbon leakage' of energy-intensive manufacturing to less regulated economies. The Government is providing £250m until 2015 to help energy-intensive users address costs arising from the EU ETS and the carbon floor price. Liberal Democrats support the continued use of such measures, where there is significant risk of carbon leakage and the levels of assistance are proportionate to need. This should include assistance in helping with the capital costs of moving to lower-energy production methods and support for research and development that will lead to further efficiency gains. Support should be time-limited in order to drive the behavioural change needed to permanently reduce emissions and measures should be taken to avoid over-compensating large companies already profiting from the over-allocation of EU ETS allowances.

7.3 The 2010 coalition agreement contained the commitment to "*ensure that UK Trade and Investment and the Export Credits Guarantee Department [now UK Export Finance] become champions for British companies that develop and export innovative green technologies around the world, instead of supporting investment in dirty fossil-fuel energy production*". So far this measure has not been implemented. Liberal Democrats would ensure that both these agencies withdraw fully from supporting all fossil fuel-related sectors, and instead increase support to exports of low-carbon technologies and services; this is likely to need legislation to amend their remits.

7.4 Alongside climate change, business and governments will have to face the challenge of steadily increasing prices for many natural resources, such as metals and minerals, under pressure from the rapid industrialisation of many developing countries, and the exhaustion of existing supplies. Government should accept the notion of the 'circular economy', encouraging maximum resource productivity alongside built-in waste reduction, and changing the nature of consumers' relationship with products and services, making more use of product rental and collaborative consumption models. Taxation and regulation should be employed to encourage reuse and minimise waste and resource use. Detailed proposals are contained in policy paper 93, *Our Natural Heritage*.

Agriculture and Land Use

8.1 Agriculture, forestry and land management together generated 9 per cent of UK greenhouse gas emissions in 2011, including 43 per cent of total UK methane emissions and 84 per cent of total UK nitrous oxide emissions. It will not be possible to eliminate these emissions entirely, as they result largely from natural processes in soils and the digestive systems of farm animals. However they can be both reduced – the UK has seen a 30 per cent fall since 1990, due mainly to lower livestock numbers, less intensive agricultural practices and more efficient use of fertilisers – and offset, primarily through afforestation.

8.2 Government needs to work with the industry to improve nutrient and irrigation water use and livestock productivity, reduce intensive cultivation and make better use of on-farm energy and fuel. This will not only reduce emissions and bring other environmental benefits but can increase productivity and reduce costs. The EU's Common Agricultural Policy (CAP) has the potential to move farming practices in these directions, but the current reform proposals, while welcome in moving away from income support to delivering payments for environmental benefits, are unambitious. Liberal Democrats would work with the Commission to plan for a mid-term review of the CAP in 2017 to build on the current reforms. In particular, linking farm subsidies to greenhouse gas emissions, as well as conservation services, should be examined, as should options for delivering equitable support for farming and forestry. We also aim to improve land management practice for natural carbon sequestration and reduce fossil fuel use.

8.3 Biochar is the name given to the inert carbon residue that remains when organic waste is burned in a low-oxygen environment (the biogas thus produced can be used for heating or power or generation). Biochar can be used as a soil improver, as it helps retain trace minerals which plants need to grow; ground-up biochar can also be used in animal feed for ruminants to reduce the amount of methane they release. The use of biochar in agriculture thus has the potential to both sequester carbon and improve productivity, though its long-term stability is not yet proven. Liberal Democrats would support further study and demonstration projects.

8.4 Much can be done to reduce emissions from horticulture. We will use the planning system to facilitate the use of low-grade heat from power stations and other sources to warm glasshouses and, where appropriate, capture carbon dioxide to boost the growth of crops such as tomatoes. We will support the use of renewable energy sources such as wood fuel, thus linking food security and energy security. We will also facilitate research into closed-cycle food production such as combining aquaponic salad crop production with fish farming, where the waste from the fish feeds the plants.

8.5 Consumer eating habits are also important. Liberal Democrats would adopt a National Food Strategy to secure the production and consumption of sustainable and healthy food (addressing issues of climate change and environmental protection among others), and publish a coherent framework for reducing greenhouse gas emissions from agriculture. This would include using public procurement policy to grow the market for sustainable food, and setting a target date for zero food waste to landfill. Red meat production – especially beef raised on animal feed – is particularly climate-intensive; consumer education should concentrate on increasing awareness of the climate impacts of different foodstuffs, and public procurement policy should favour the least carbon-intensive foods.

8.6 Trees are a highly effective natural means of removing carbon from the atmosphere. While there has been a major increase in UK forest cover over the past ninety years, from 5 per cent in the 1920s to 12 per cent today (an area of 3 million ha), this is still well below the EU average of 37 per cent, and current levels of woodland creation are low. Liberal Democrats aim to triple the current rate of planting, on both private and public land, to reach a target of an additional 1 million ha by 2050, bringing UK forest area to 16 per cent. This level of planting would deliver, by the 2050s, emissions abatement equivalent to about 15MtCO₂ per year – about 10 per cent of remaining UK emissions if the Climate Change Act's 80 per cent target was met.

8.7 Woodland creation is highly cost-effective in reducing emissions, generally costing no more than £25 per tonne CO₂, far less than most other options; other benefits include the creation of jobs, ecosystem services such as water quality and flood alleviation, more wildlife habitats and opportunities for recreation and a reduction in wood imports. Liberal Democrats would develop a strategy for expanding forestry, building on the work of the Woodland Carbon Task Force established in 2010 – including reviewing the EU grant support structure, increasing funding for woodland grants and capital support for forestry businesses, working with major land-owners, such as water companies, ensuring better carbon management of existing forests, encouraging more continuous-cover forestry and small-scale felling with natural regeneration, and using more native species. We will encourage the wider use of timber and wood, in particular in new housing and other construction, using regulations and, where feasible, tax incentives such as lower rates of VAT for low-carbon materials such as wood.

Putting Consumers at the Heart of the Zero Carbon Transition

9.0.1 Consumers must win from the transition to a zero carbon economy. Liberal Democrats seek to develop a decarbonised energy market; we want that market to benefit the consumers who will pay for it.

9.0.2 Fuel prices have been trending steadily upwards over the last ten years, placing energy consumers under increasing pressure. The average prices of gas and electricity paid by UK households have risen by around 41% and 20% (in real terms) respectively, since 2007.

9.1 Empowering Consumers

9.1.1 DECC analysis shows that 85% of the present average household dual energy bill is determined by international prices for fossil fuels, network costs and other supplier margins and costs. Energy bills are likely to continue on an upward trend over the next few years, mainly as a result of rising fossil fuel prices and network costs. The UK government cannot control global energy costs but Liberal Democrat policies to reduce energy demand and decarbonise electricity, transport and heat will help the country become less dependent on imported energy and less exposed to volatility in global fossil fuel prices.

9.1.2 Householders will benefit directly from our policies to deliver increased energy efficiency. These include: our flagship Green Deal programme for insulating homes; tighter efficiency standards for household energy appliances (TVs and set-top boxes, consumer electronics and lighting); the replacement of boilers with more efficient gas condensing versions (as a result of Building Regulations); and the roll-out of 'smart meters' to all households by 2020, helping households make more informed energy decisions. DECC analysis shows that in 2020 households are estimated on average to save around 11% on their energy bills compared to what they would have paid had we not taken action.

9.1.3 Some measures to help decarbonise the UK's energy supplies, such as the Renewables Obligation (RO), have an impact on retail prices. Liberal Democrats would use the levy control framework to help ensure that these policies achieve their objectives cost effectively and affordably, providing certainty to investors in all generation technologies and protecting consumers from excessive increases in power bills.

9.1.4 Liberal Democrats in Government are creating a market-wide incentive for energy saving, or 'negawatts', for the first time, starting with a pilot in 2014. Under negawatts, generated energy is replaced with a cheaper MWh of avoided energy, delivering a net saving to consumers. The government has chosen to support negawatts through the capacity market, so the costs of that are socialised through the grid, rather than levies on consumer power bills.

9.1.5 Liberal Democrats in Government are taking action to put more power in consumers' hands and make tariff switching simpler. This includes:

- Supporting Ofgem's reforms to simplify tariffs and make the market fairer and more transparent for consumers.

- Reducing the number of core tariffs.
- Requiring energy suppliers to inform customers about the cheapest deal that suits their individual preferences and then give them the opportunity to switch.
- Requiring energy suppliers to make bills easier to understand and provide price comparisons in electronic formats.
- Ensuring customers on uncompetitive 'dead' tariffs and people who are on fixed deals are automatically moved to their supplier's cheapest variable rate tariff.
- Giving Ofgem new powers to crack down on rogue switching sites.
- Promoting collective switching initiatives, in which communities coming together to use their bulk buying power to get better deals.
- Setting up the Big Energy Saving Network, to work with voluntary organizations and community groups to help vulnerable consumers find the best deals.

9.1.6 Liberal Democrats would enhance these policies by:

- Expanding the Green Deal (see Section 3.2.7).
- Using tax incentives to encourage households to use energy more efficiently (see Section 3.2.8 and 3.2.9).
- Bringing in new measures to encourage people to save energy, working to improve EU energy labelling standards (see Section 3.5.1) and promoting the smarter use of energy (see Section 3.5.3).
- Stopping energy companies from charging higher per unit prices to consumers who save energy.
- Promoting a more diverse energy market (see Section 4.7) and community energy projects, to give consumers more choice (see Section 4.8).

9.2 Tackling Fuel Poverty

9.2.1 The zero carbon economy should be inclusive, but around 6 million households in the UK now live in fuel poverty; that is, they spend more than 10% of their income to heat a home to an adequate standard of warmth. Fuel poor households are economically disadvantaged and they generally need to spend more on fuel, in absolute terms, to achieve a warm and healthy living environment. In 2012, the Hills Review warned that fuel poverty is a serious national problem that is set to worsen rapidly.

9.2.2 Liberal Democrats in Government have:

- Introduced the Warm Home Discount Scheme, providing £1.1bn from energy suppliers over four years to help around 2 million low income and vulnerable households with energy costs.
- Introduced the Green Deal, which will upgrade hardest to heat homes at limited upfront cost.
- Targeted at least £540m p.a. under the Energy Company Obligation (ECO) on funding energy improvement in the poorest homes.

9.2.3 Existing policies can be developed and improved. Winter Fuel Payments, for example, cost £2.4bn a year and help poorer pensioners, but wealthier over-60s also benefit. Institute for Fiscal Studies research has shown that just 40 per cent of the payments are spent on fuel costs.

Liberal Democrats would reform Winter Fuel Payments to help the poorest pensioners to improve their energy performance, with priority given to those not on the gas grid.

9.2.4 The Carbon Price Floor falls more heavily on vulnerable consumers and those suffering from fuel poverty. With the EU ETS, it will deliver to the Government around £4.4bn of revenue over the next three years. In common with other EU governments, Liberal Democrats would allocate revenue from the EU ETS and the Carbon Price Floor to an energy efficiency programme designed to assist households suffering from fuel poverty.

9.2.5 According to Government estimates, the ECO will still only remove a tiny fraction of households from fuel poverty by 2022. Liberal Democrats would ensure that energy companies expand the assistance provided through ECO to those in fuel poverty.

The International Climate Framework

10.1 Climate change, a global challenge, is clearly best met through a globally coordinated response. Liberal Democrats were the first of the major UK parties to call for a legally binding international climate treaty, and Liberal Democrat ministers played a crucial role in getting the negotiations for a new treaty to follow the Kyoto Protocol back on track after the disappointment of the Copenhagen climate conference in 2009. All being well, the new treaty will be agreed in 2015, to enter into force by 2020 at the latest.

10.2 Liberal Democrats want to see an effective treaty, containing commitments from all countries for emissions reductions, with the richer countries taking the lead, supported by a well-financed Green Climate Fund, providing assistance to poor countries with both mitigation and adaptation. It must be a high priority for the UK government to bring the negotiations to a successful conclusion. This includes:

- Pressing ahead with ambitious domestic climate policies, as outlined in the rest of this paper. As a developed industrial country, historically responsible for more than an average per capita global share of greenhouse gas emissions, the UK has a responsibility to reduce emissions while at the same time demonstrating that investment in low-carbon technologies can be a successful development path.
- Playing a political leadership role in appropriate international forums, including the EU, UN (including the UN Secretary-General's climate summit scheduled for 2014) and the G8; we condemn the Prime Minister's decision to exclude climate change from the G8 agenda this year, when the UK holds its presidency.

10.3 Continuing to commit to providing financial support and capacity-building. We applaud the coalition government's success in reaching the UN target of 0.7 per cent of GNP in official development assistance; an increasing proportion of the total should be devoted to explicitly low-carbon and climate-resilient development objectives, building on the current International Climate Fund, and the remainder of the aid budget scrutinised carefully to ensure it does not conflict with this aim. The UK should contribute generously to the new Green Climate Fund currently being established.

10.4 Before the new treaty enters into force, UK diplomatic efforts and development assistance should be deployed to encourage as many countries as possible to adopt ambitious emissions reductions targets for the remainder of this decade, and to support adaptation strategies in poor countries.

10.5 In all these efforts, the UK is far more effective operating through the European Union. The collective economic and political strength of the EU carries much greater weight in international diplomacy than the UK does operating alone. Ambitious action by the EU – including adopting at least a 50 per cent emissions reduction target by 2030, as explained in Section 2.3.1 – will do more than most other actions to maximise the chances of success in the climate negotiations.

10.6 The UN climate process tends to be focused on controlling emissions of carbon dioxide, the most important greenhouse gas - but also, because of its sources in a huge range of energy uses, industrial processes and agriculture, the most difficult to reduce. There are many additional

options for action outside the climate process, but complementary to it, which can effectively buy time for the more complex and longer-term policies to be put in place to reduce carbon dioxide.

10.7 We welcome the UK's decision to join the Climate and Clean Air Coalition, set up by the US, Sweden and other countries to coordinate action against 'short-lived climate forcers' such as methane, black carbon (soot) and hydrofluorocarbons (HFCs), together responsible for at least a third of current global warming (and recent research is suggesting that black carbon may have more of an impact than originally thought). Development assistance should be used to tackle these problems in developing countries, for example by replacing inefficient cookstoves, controlling emissions from diesel engines and limiting flaring from oil and gas extraction.

10.8 HFCs (artificial greenhouse gases used in air conditioning and refrigeration, whose use is expanding at 10-15 per cent a year) should be added to the Montreal Protocol, the ozone treaty, whose production and consumption phase-out model is better suited than the emissions controls of the Kyoto Protocol (since there are already alternatives available for most uses of HFCs). The EU should adopt an ambitious schedule for phasing out HFC use as quickly as possible, through the Fluorinated Gas regulation currently under discussion; the UK (Defra) should stop blocking other member states' attempts to improve the targets in the draft regulation.

10.9 Changes in forest cover and land use account for about 17 per cent of global greenhouse gas emissions. Although the global rate of deforestation is slowing down, between 2000 and 2010 it still stood at 13 million ha a year. Although the pre-Copenhagen hopes for the emergence of a global market for forest carbon credits through a REDD+ mechanism (reducing emissions from deforestation and forest degradation, plus conservation) have not been realised, there is much that can be done. Timber-producing and -consuming countries should take joint action to tackle the root causes of deforestation, primarily clearance for agriculture. Development assistance should be used to encourage improving sustainable agricultural yields; many current farming and pastoral practices are extremely wasteful. Consumer countries such as the UK should use public procurement policy to source sustainable palm oil, soy, beef and other key commodities.

10.10 Extra effort should be made in improving forest law enforcement and governance in developing countries, often the most cost-effective way of achieving sustainable forest management and reducing deforestation. The EU, which is currently negotiating a series of Voluntary Partnership Agreements (VPAs) with timber-exporting developing countries, has a good record here; achieving the kind of governance standards which the VPAs aim at should be a precondition for access to REDD+ finance. Finally, the UK and EU should adopt a commitment to zero net deforestation, globally, by 2020, and work together with the international Consumer Goods Forum and the many major companies which have committed to that target to make it a reality.

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This paper has been approved for debate by the Federal Conference by the Federal Policy Committee under the terms of Article 5.4 of the Federal Constitution. Within the policy-making procedure of the Liberal Democrats, the Federal Party determines the policy of the Party in those areas which might reasonably be expected to fall within the remit of the federal institutions in the context of a federal United Kingdom. The Party in England, the Scottish Liberal Democrats, the Welsh Liberal Democrats and the Northern Ireland Local Party determine the policy of the Party on all other issues, except that any or all of them may confer this power upon the Federal Party in any specified area or areas. The Party in England has chosen to pass up policy-making to the Federal level. If approved by Conference, this paper will therefore form the policy of the Federal Party on federal issues and the Party in England on English issues. In appropriate policy areas, Scottish, Welsh and Northern Ireland party policy would take precedence.

Many of the policy papers published by the Liberal Democrats imply modifications to existing government public expenditure priorities. We recognise that it may not be possible to implement all these proposals immediately. We intend to publish a costings programme, setting out our priorities across all policy areas, closer to the next general election.

Working Group on Transition to a Zero Carbon Britain

Note: Membership of the Working Group should not be taken to indicate that every member necessarily agrees with every statement or every proposal in this Paper.

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