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of Energy &
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HM Government

Delivering UK Energy Investment

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I am proud that **15%** of the **UK's electricity** is now **renewable** and rising fast.



Ministerial foreword

Promoting the UK's economic growth through sustainable and secure home grown energy.

When the Coalition Government came to power in 2010, we inherited a legacy of underinvestment in energy, especially electricity. It was clear this needed urgent attention if we were to keep the lights on, as a fifth of our existing power stations were scheduled to close by 2020 because they were old, inefficient or polluting.

But this was only part of the energy investment challenge facing us. To meet our climate change targets, we would have to reform our electricity markets to attract clean, low carbon electricity generation cost effectively. We needed to start decarbonising heating and transport too. We needed to invest in making our housing stock more energy efficient. We needed to modernise our transmission and distribution systems. And we needed to address the UK's gas security, as imports of gas were rising fast, as North Sea production was falling.

Our new policies for investment and reform had to address the “energy trilemma” – the challenge of keeping the lights on, at an affordable price, while decarbonising our power system. And we had to do all this in a time of austerity, in a world of great uncertainty, partly caused by the speed of innovation and technological change across the energy sector.

Given long established market failures to provide sufficient generating capacity or to address the cost of greenhouse gas emissions, we knew we would have to intervene – and improve upon the forms of intervention we inherited. So we decided to introduce market-based tools – with the aim of creating the world's first ever low carbon electricity market. So competition and private investors could help us meet our investment challenge, at the lowest possible cost. That's what the 2013 Energy Act did.

With that Act and a large set of other energy and climate change policies, energy investment in the UK has now turned a corner. This report tells you the sheer scale of that energy investment success story – and how investment in energy infrastructure has played and is playing an essential role in the UK's economic recovery.

Of the infrastructure investment that has happened since 2010 – and of the infrastructure investment pipeline out to 2020 and beyond – energy leads. In fact the UK's future energy infrastructure investments are larger than transport, water and communications combined. From the £45 billion invested in electricity generation and networks alone between 2010 and 2013, to the energy project pipeline estimated at over £200 billion, the economic impact is huge.

Take one major low carbon electricity technology – nuclear. In 2013 the government granted development consent for construction of the first nuclear power station in the UK since 1995 – at Hinkley Point in Somerset.

This £16 billion project could bring major investment to our economy, supporting 25,000 jobs and driving £40 million per year in growth into the regional economy, and reaching over £2 billion over the lifetime of the project.¹

And there's a pipeline of new nuclear investment opportunities. Following its acquisition of Horizon Nuclear Power in 2012, Hitachi plan to deploy their new reactors at Wylfa on the Isle of Anglesey, and later in Oldbury, Gloucestershire, with the potential to bring an estimated total investment of approximately £20 billion across both sites.² In May 2014 Toshiba and GDF Suez committed £200 million of investment to develop a new nuclear plant at Moorside in Cumbria, a £10 billion investment into the UK with the potential to support up to 21,000 jobs.³ Together with Vince Cable, I published an industrial strategy in 2013 to ensure UK firms and people maximise the economic benefits and the jobs from these key energy investments.

Yet while nuclear investments are still to come, the UK is already benefiting from massive new investments in renewable energy. I am proud that 15% of the UK's electricity now comes from renewable sources, and that our

More than **£45 billion**
was invested in electricity generation
and networks between 2010-2013.⁶

Already there are over **100,000 jobs** in the **UK's multi-billion** pound energy efficiency sector.⁷

renewable electricity capacity is continuing to increase.⁴ The average annual investment in renewables has more than doubled since 2010, and in 2013 alone almost £8 billion was invested across a range of renewable technologies with more already planned and committed.⁵ From onshore wind to solar, from energy from waste to biomass, renewable electricity projects have been spread across the country, helping to ensure the UK's future economy will be more balanced, as well as green.

A key challenge has been to invest early in emerging low carbon technologies that will be key for electricity generation in the next decade, so we can drive the costs down. Our investment in offshore wind has made

the UK the world leader in this key renewable technology of the future. The UK is home to the world's largest offshore wind farm, the London Array. In Hull Siemens and ABP Ports are investing £310 million in two new offshore wind turbine factories, supporting up to 1,000 direct jobs⁹, and ensuring that the UK gets the economic benefits from the developing offshore wind industry.

Our support for carbon, capture and storage (CCS) is another example where we are backing a new low carbon technology that has the potential to grow into a new industry. With two commercial scale CCS projects now in final design stage and with our investment in CCS innovation, we are already leading Europe.

In attempting to tell the full story of energy investment, this report goes wider. Since 2010, new business opportunities are being created in the UK, across the range of energy

Energy projects currently account for around **60%** of the UK's total infrastructure project pipeline, totalling over **£200 billion**.⁸

sectors, including in the oil and gas industry, in renewable heat technologies and in new energy efficiency measures, including new smart energy technologies. Together these energy sectors are supporting thousands of jobs today. Our electricity market reforms alone have the potential to support up to 250,000 jobs in low carbon energy generation by 2020.¹⁰

We must not underestimate the challenges ahead. The UK is competing with many other nations for international investors' capital. I have been relentless in trying to build a financial and regulatory regime that is stable and predictable – as that is essential for attracting long term investors. Indeed, I am pleased that this report shows how we have built real confidence amongst UK and foreign investors, who now see the UK as an attractive destination to invest in our essential major national energy infrastructure projects. That support comes from around the globe from China, to Japan, to Europe, the Middle East and the Americas.

Yet providing such stability is never easy – not least when the energy debate becomes as political as the UK's has. So it is vital that people understand that policy actions or

proposals that add to uncertainty, actually add to costs for consumers and business – as investors seek higher returns to offset the perceived increased risks.

Indeed, by publishing the UK's first annual investment report into UK energy, I want to foster a shared understanding of these energy investment challenges, to demonstrate what we are doing to overcome them, and to highlight the many opportunities for investment both now and in the years ahead.

This report is the first in an on-going series of reports that will provide a regular stocktake of how we are progressing and provide confidence that the energy security challenge is being met whilst we also act to make the UK one of the world's leading low carbon, energy efficient nations.



Ed Davey



Executive summary

This report is the first comprehensive assessment of the investment in UK energy, and a detailed look ahead at the investment challenge in the years and decades to come.

It considers both supply and demand side of the full range of energy sectors and technologies. For each energy sector and technology the report examines the progress the sector has made to date, the strength of the sector, its installed capacity and employment and the opportunities that are in the pipeline for future investment to 2020 and beyond. It also appraises the domestic and global risks facing investment and what the UK is doing to mitigate the impact on investment in UK projects.

The UK is rated the most energy secure country in the EU, and fourth in the world as a whole⁵³. Nevertheless, the Coalition government inherited a huge investment challenge across all energy sectors to deliver reliable, secure and cost effective energy supplies in the future and deliver our long term objectives to meet our climate change targets as set out in the Climate Change Act 2008, and cut overall carbon emissions.¹¹

The introductory chapter describes the scale and nature of this challenge. The National Infrastructure Plan 2013 puts the pipeline of investment in energy at over £200 billion – more than the £151 billion investment in communications, transport and water combined.¹² Between 2014 and 2020, we could need to invest up to £100 billion in the electricity system alone.¹³

This report demonstrates that the historic underinvestment in the UK's energy infrastructure is being turned around: from our primary sources of energy, oil and gas, renewable energy, nuclear and carbon capture and storage, to electricity infrastructure and networks, and finally to heating and energy efficiency measures.

Over **two fifths** of **energy** used in the **UK** is used for **heating** in one form or another – and heating demand accounts for over **60%** of **natural gas** use.¹⁴

The government has delivered the most radical reform of the energy system since the electricity market was privatised, with reforms right across the sector from offshore oil and gas, to the way our electricity markets operate, through to the way consumers are billed for the energy they use. The 2013 Energy Act will boost our economy, helping to deliver the low carbon electricity generation we need and support up to 250,000 jobs in low carbon generation by 2020.¹⁵

Energy supply

Electricity generation is at the heart of the UK energy system and, along with networks, forms the largest part of the investment challenge. There has been substantial investment totalling £45 billion of investment in electricity generation and networks, between 2010-2013.¹⁶ We have analysed this investment made and the pipeline of investment across the different forms of energy supply.

Renewables

- Since 2010, an average of £7 billion has been invested each year in UK based renewable energy, compared to £3 billion a year in the previous parliament.¹⁷
- In 2013 alone, almost £8 billion was invested across the range of renewable technologies, a record high.¹⁸
- Electricity generation from renewable sources has doubled since 2010 and now supplies 15% of the UK's electricity.¹⁹
- In April 2014, eight renewable energy projects were awarded an Investment Contract, providing up to £12 billion of private sector investment and supporting up to 8,000 jobs.²⁰
- The UK is the clear world leader in offshore wind and has more installed capacity (3.8GW) than any other country, supporting 18,300 jobs.²¹ By 2020 we could see capacity reach 10GW, enough to power almost 7 million homes.²²
- Onshore wind attracted an estimated £7.6 billion of investment between 2010-2013 and supports 17,100 jobs. The pipeline is strong and our ambition is for 13GW capacity by 2020.²³

Nearly **£8 billion**
was invested across a range of
renewable technologies in 2013 alone.²⁴





£45-60 billion

worth of investment opportunities to
insulate the UK's housing stock.²⁵



Energy efficiency policies saved the UK **£4 billion** on its fuel bills in 2013 and are estimated to save a total of **£20 billion** from fuel bills in **2020**.²⁶

- Solar PV supports 15,600 jobs and attracted £6.4 billion of estimated investment between 2010-2013,²⁷ with the cost of installations falling by almost half since 2010.²⁸
- Biomass and bioenergy support 14,700 jobs and attracted £6.3 billion of estimated investment between 2010-2013. By 2020, biomass could be providing electricity for around 8 million homes.²⁹
- Most suitable sites for large-scale hydropower in the UK have already been utilised, but refurbishment and small-scale hydro schemes could see up to £500 million invested up to 2020.³⁰
- The UK is the world leader in the development of the emerging wave and tidal stream sectors.³¹ It is estimated that the wave and tidal stream sectors overall could see £500 million investment up to 2020.³²

Nuclear

- There was £2 billion of estimated investment in nuclear power between 2010-2013.³³
- Consent has been granted for the construction at Hinkley Point of the first new nuclear power station in the UK since 1995, worth £16 billion, supporting 25,000 jobs³⁴ and industry has set out plans that include £20 billion of investment for new reactors at Wyfla³⁵ and £10 billion for a new plant at Moorside.³⁶

Carbon capture and storage (CCS), and gas generation

- The UK is the only country in Europe with two carbon capture and storage projects in development supported by up to £1 billion of government funding. These projects could support more than 2,000 jobs during construction and generate enough clean electricity for 1 million homes.³⁷
- Gas-fired power stations saw an estimated £2.5 billion of investment between 2010-2013. To replace old plant and provide resilience, between £4.1 billion and £4.7 billion of estimated investment could be needed to 2020.³⁸

The pipeline of investment in **energy** is over **£200 billion** – more than the investment in **communications, transport** and **water** combined.³⁹

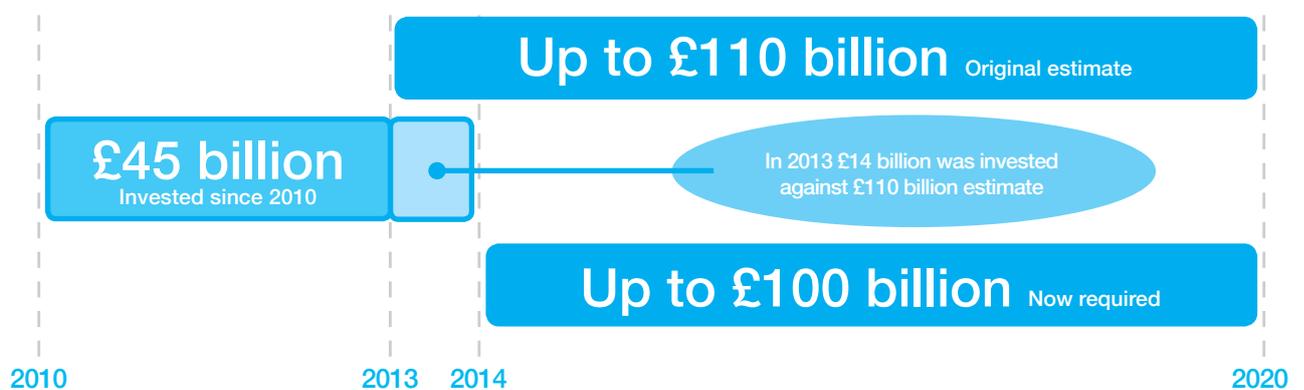
Oil, gas and shale

- Private investment on the UK continental shelf has almost doubled since 2010, with development capital expenditure higher in 2013 than at any point in the last decade.⁴⁰
- The government is implementing recommendations from the Wood Review with the aim of maximising economic recovery of our offshore oil and gas resources.
- Shale gas and oil represents a huge economic opportunity, largely onshore, which could attract £3.7 billion a year and support 60,000 jobs.⁴¹

Networks

- Over £16 billion has been invested in onshore and offshore electricity networks since 2010. Interconnection projects worth £1 billion have been delivered.⁴²
- Between 2010-2014 over £3.8 billion has been invested in gas transmission and distribution networks supporting 11,500 jobs.⁴³
- Ofgem estimates that over 8,000 additional jobs will be supported to 2021 in the electricity transmission sector alone.⁴⁴

Our latest analysis shows that £110bn investment needed in electricity now stands at up to £100 billion through to 2020.⁴⁵



Heat

Heat is the single biggest reason we use energy. This means there is an enormous investment opportunity for new and renewable forms of heating.

- The UK has the world's largest market for high efficiency condensing gas boilers and UK households spend over £3.75 billion a year on new gas boilers supporting over 100,000 jobs.⁴⁶
- The Renewable Heat Incentive could unlock around £13 billion on investment in lower-carbon heating systems by 2020.⁴⁷
- Investment in Combined Heat and Power systems is expected to reach £5 billion by 2020.⁴⁸

Energy demand - efficiency and smart technology

Investing in energy efficiency and smart meters and smart grids is a cost-effective way to support growth, cut bills, enhance business productivity, improve living standards and cut carbon emissions. The multi-billion pound energy efficiency market in the UK now supports over 100,000 jobs. UK's energy intensity has fallen by a fifth since 2003. Household energy consumption has also fallen by a fifth since 2004, saving the average consumer £200 a year.⁴⁹

- Over the next 3 years 1.1 million households will benefit from Energy Company Obligation (ECO) and Green Deal measures, and see around £1 billion per year of investment by energy company spending through ECO.⁵⁰
- In the UK, products policy and energy labelling will lead to some £4 billion of UK investment to 2030.⁵¹
- The roll-out of smart meters will see £7.5 billion of private investment up to 2020 supporting 10,000 jobs during peak installation.⁵²

The **UK** is now ranked one of the most **energy secure countries** in the world and the most energy secure in the **EU**.⁵³



Introduction

The UK's economic growth and our national wellbeing are built on a foundation of affordable, sustainable and secure energy supplies.

The huge investment challenge, inherited by this Coalition government, crosses all energy sectors: from our primary sources of energy, including oil and gas, renewable energy, nuclear and carbon capture and storage, to electricity infrastructure and networks, all the way to heating and energy efficiency measures.

This report sets out how the government has delivered the most radical reform of the energy system since the electricity market was privatised, with reforms right across the sector from offshore oil and gas to the way our electricity markets operate, through to how consumers are billed for the energy they use. The long term direction we have set will reduce our energy demand, safeguard our energy security and meet our goals for reducing emissions and increasing the proportion of energy from renewables and other low carbon sources. Progress on a

certain, stable, transparent framework that encourages innovation has helped support jobs and economic growth across the UK. The market reforms that we are actively putting in place will help support up to 250,000 jobs in low carbon energy generation by 2020.⁵⁴

This action has been set against a backdrop of tough economic conditions. As the capital markets recover from the global financial crisis, there has been a reduction in the overall equity and debt finance capital available for projects. Even as the economy recovers and enjoys renewed growth, competition for capital remains intense. Investment in our energy system is mainly financed by capital from the private sector, which is internationally mobile and has a choice about where it invests. The openness of the UK market to foreign investment is helping to maintain our status as an attractive place for investment, and enable us to secure that investment at the lowest possible costs to our consumers. The National Infrastructure Plan 2013 put the pipeline of investment in energy at over £200 billion – more than the £151 billion investment in communications, transport and water combined.⁵⁵

Between 2010-2013 we attracted more than £45 billion of estimated investment in electricity generation and networks.⁵⁶

This government's energy investment strategy will reduce the UK's greenhouse gas emissions, whilst creating a prosperous low-carbon future with clean air, clean fuel, and clean transport.

Our investments in new low carbon technology complement the work we are doing to tackle climate change on the European and global stages. The UK has led the debate within the European Union to press for more ambitious targets to reduce Europe's greenhouse gas emissions. We are actively building coalitions for ambition on climate action ahead of the critical 2015 global climate change talks, when the world's governments will come together to agree a sustainable way forward to protect our planet for generations to come. We have signed an agreement to work with the Chinese to achieve a global climate change deal in 2015.

Between 2014 and 2020 a further £100 billion could be needed in the electricity system alone.⁵⁷

Our policies to reduce demand through energy efficiency, and decarbonise and improve the efficiency of heating supply are driving savings on bills and reducing UK emissions. We are committed to leading the way in Europe on energy efficiency so that we reduce the burden on supply capacity and help consumers with their energy bills. The benefits of this are clear. In 2013 alone, we estimate the government's demand side policies saved £4 billion on fuel bills across the UK.⁵⁸

£50

cut to household energy bills in 2014.



We have produced a Carbon Plan to illustrate the various options the UK has in order to reduce our carbon emissions, and meet our Climate Change Act targets. The Carbon Plan shows that the UK cannot move away from a fossil fuel economy to a low carbon one overnight, and that even by 2050, the UK will still need supplies of oil and gas.

This emphasises the need to continue to support private investment in oil and gas, to ensure our energy security and minimise the UK's growing dependency on imports. That is why we commissioned Sir Ian Wood to review the potential in the North Sea and why we have accepted his report in full. Implementing the recommendations of the Wood Review will require government and industry to adopt a new, more collaborative, approach to stewardship of the UK Continental Shelf. Creating the right environment for economic recovery is vital. Sir Ian Wood's report estimated at least 3-4 billion more 'barrels of oil equivalent' could be recovered over the next 20 years, bringing over £200 billion of additional value to the UK economy.⁵⁹

The Energy Act 2013 has reformed the market for electricity generation and networks, introducing new instruments that will give price certainty and private law contracts for low carbon investment. This gives industry and investors certainty to invest without the risk of political interference, and ensures consumers pay a fair price for low carbon electricity.

The Capacity Market will provide a steady, predictable revenue stream to investment in gas generation, which remains an integral part of the UK's electricity mix. Britain's world-leading plans to develop cost competitive carbon capture and storage technologies means that gas will continue to play a major role in a decarbonised economy.

Different forms of heating account for nearly half of the energy used in the UK, with heat demand accounting for over 60% of our natural gas use.⁶⁰ Decarbonising our heating supply and improving the energy efficiency of heating is a huge challenge, which is why we are driving investment in energy efficiency and renewable heat, including incentives for businesses and households to take up renewable heat.

Investing in energy efficiency and smart energy technologies enhances business productivity, improves people's lives and cuts carbon cost-effectively. For example, as a result of a recently signed £600 million Smart Meter contract with British Gas; meter manufacturer, Landis+Gyr expects to double its 600-strong UK workforce as part of an extension of its manufacturing facilities to support the national roll out of smart meters.⁶¹ The Green Deal and ECO work in partnership to upgrade Britain's cold homes, with a goal to make 1 million homes more energy efficient by March 2015, compared with January 2013.⁶² And through better energy using product standards and innovation, an increasingly gadget and appliance-hungry country has not been accompanied by a proportionate increase in electricity demand.

The government has remained acutely aware that the cost of energy is a real concern for many people and businesses. So alongside the drive for investment in clean energy security, we have been reforming the retail markets to drive competition and put more power in the hands of consumers. In addition to making it easier to switch suppliers, and for simpler

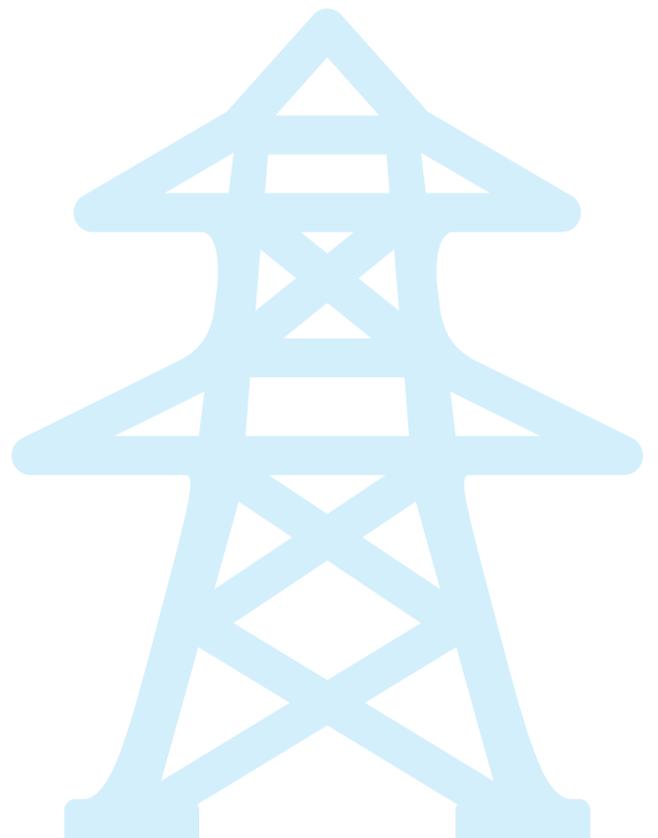
billing and fewer tariffs, the government has directly acted to cut the amount households pay towards the cost of social and environmental policies through their energy bills. In 2014, energy bills are £50 lower on average than they would have been without this action.⁶³

We can be proud of our reforms and our achievements so far. An estimated £45 billion of investment in electricity infrastructure has been made between 2010 and 2013.⁶⁴ In parallel to efforts to secure investment to maintain future energy security, we have also intervened with demand side measures and provisions for mothballed generators to secure capacity for the coming winter, and critically for the decade ahead when potential shortfalls are predicted. The risk of an energy crunch was due to insufficient investment in the UK's energy infrastructure in previous years. The scale of the challenge has not diminished – we will still need up to £100 billion to be invested between 2014 and 2020 in our electricity generation and networks.⁶⁵

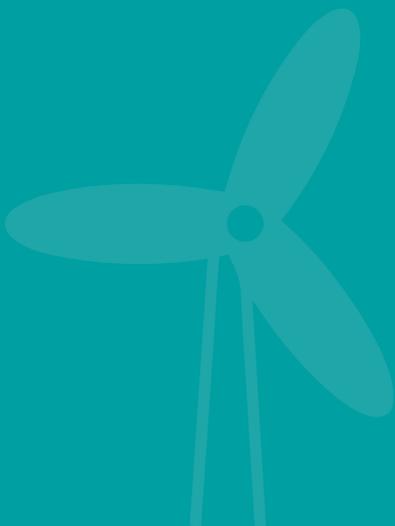
The government is working with **National Grid** and **Ofgem** to ensure the **UK's energy networks** are resilient now and in the future.

Ensuring our energy is secure to keep the lights on and avoid a crunch in capacity, is a critical economic task for government and industry. The high levels of reliability that we have enjoyed over the last few decades does not make us complacent.

With National Grid, and Ofgem, the government is working to ensure the network is resilient now and in the future. The framework and interventions we are putting in place will make sure that the market operates not just to meet demand but work in the interests of consumers to keep bills down. Not least because the energy security challenge goes far wider than electricity. It is also about energy for transport and energy for heating. Delivering this scale of investment in the UK's energy is a key part of the government's long-term economic plan, securing Britain's future and backing businesses with better infrastructure. This means more jobs and opportunities, and economic security for our country. We look forward to working with partners to deliver that challenge.



Energy supply



Energy supply

Electricity generation is at the heart of the UK energy system and, along with networks, form the largest part of the overall investment challenge. Since 2010, substantial investment has already been delivered across all aspects of electricity generation.

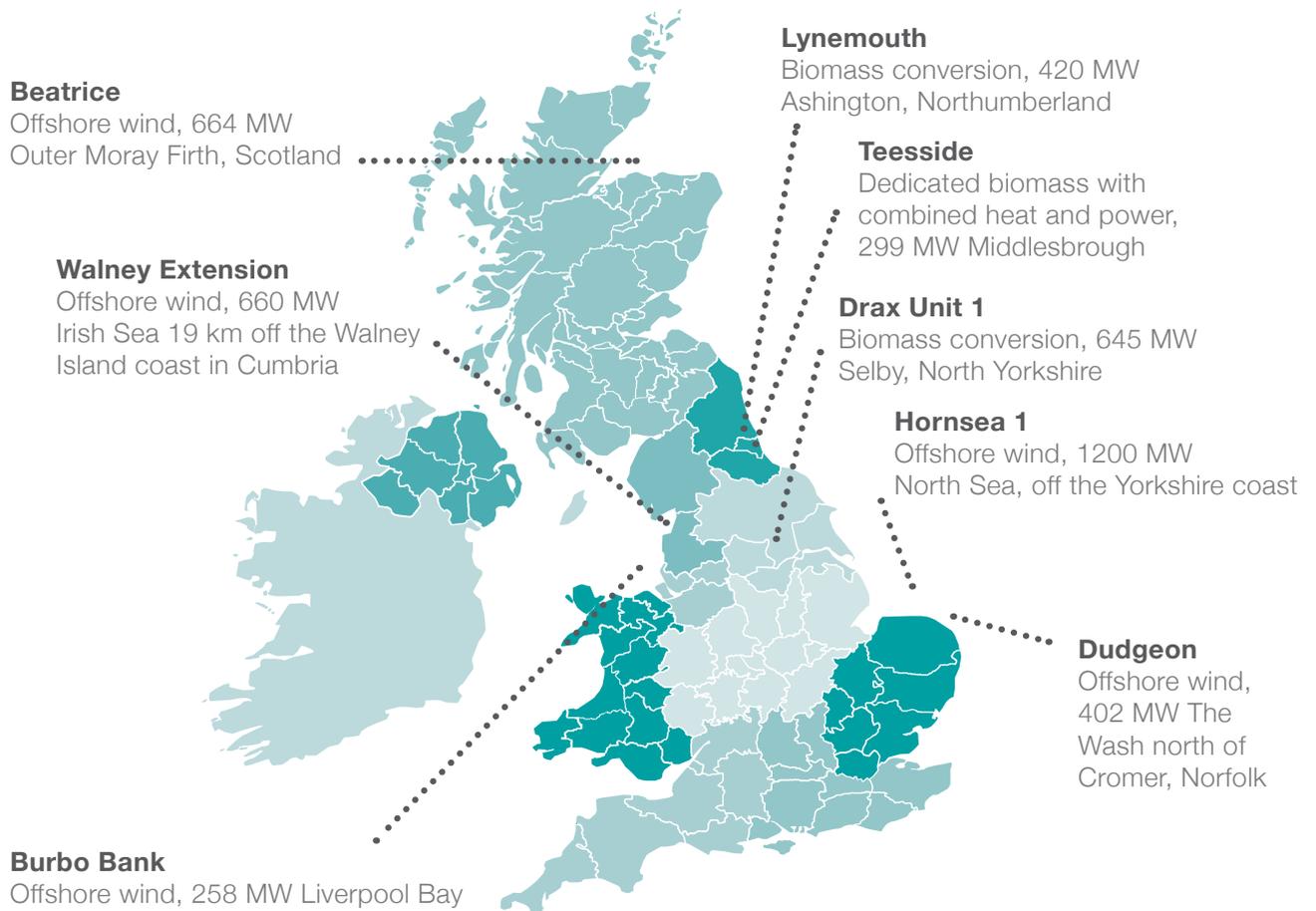
We estimate that more than £45 billion has been invested in electricity generation and networks from 2010 through to the end of 2013, primarily in renewable generation (see graph 2, page 34)⁶⁶. Our calculations suggest that up to £100 billion of further investment could still be needed from 2014 to 2020.⁶⁷

The UK now provides a highly attractive market for energy investment as demonstrated by new build renewables asset finance figures showing the UK behind only China and the US for 2013 activity, and up 59% from 2012⁶⁸ (see graph 1, page 33).

The 2013 Energy Act put in place the Electricity Market Reform (EMR) framework to help deliver the low carbon energy generation we need. Our reforms, the largest restructure of the market since privatisation, incentivise investment in low carbon energy infrastructure, cleaner power stations and reliable transmission and distribution networks. This will boost our economy by enhancing skills, developing expertise and supporting up to 250,000 jobs in low carbon generation by 2020.⁶⁹

In **2014** we awarded **Investment Contracts** to **eight renewable energy** projects expected to bring forward up to **£12 billion** of private investment and supporting at least **8,500 jobs**.⁷⁰

This map shows eight new renewable projects that have been awarded Investment Contracts (an early form of Contracts for Difference) to start generating power. These projects include biomass conversions, dedicated biomass with combined heat and power and offshore wind.



In 2013 alone, almost £8 billion was invested across the range of renewable technologies.⁷¹

The main instruments under EMR are Contracts for Difference and the Capacity Market. These will work to provide certainty to industry and investors while we maintain security of supply, make progress towards decarbonisation targets and keep prices affordable. Our design aims also to ensure that strategically important technologies can be deployed and supply chains strengthened.

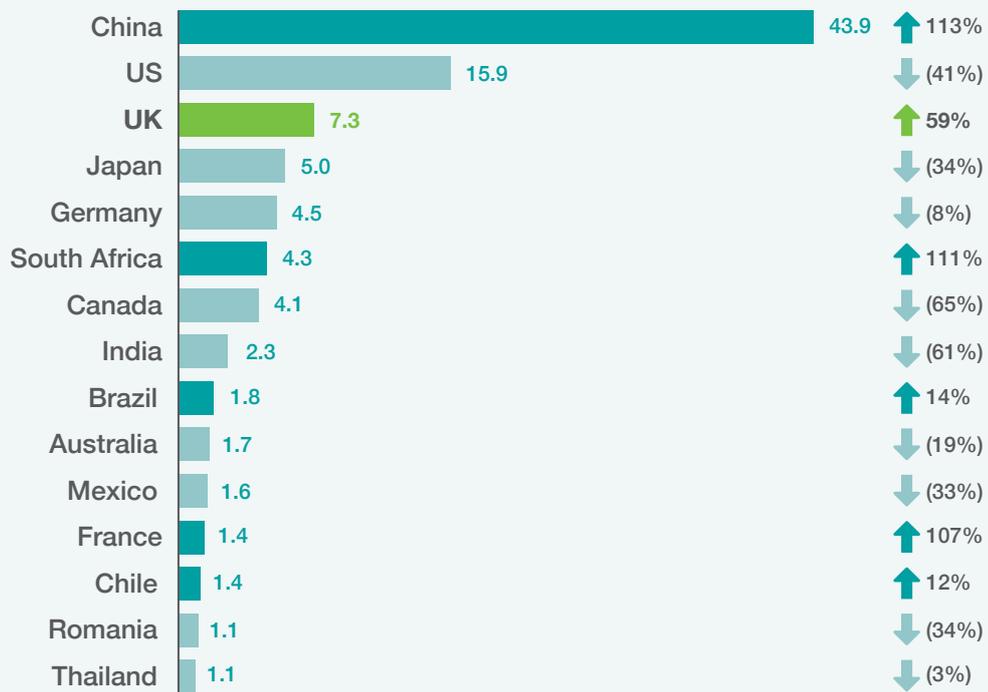
The levy control framework controls this financial support towards low carbon electricity investment. This is a substantial investment of up to £7.6 billion (2011/2012 prices) by 2020/21 and demonstrates our commitment to the sector. The levy control framework is a discipline driving value for money and restricts the number of Contracts for Difference that can be awarded.

Contracts for Difference will support the delivery of a new class of electricity generation, including renewables, new nuclear and carbon capture and storage. In April 2014, we announced that eight projects had been offered an Investment Contract (an early form of Contracts for Difference) through the Final Investment Decision (FID) Enabling for Renewables process. These projects are

expected to bring forward up to £12 billion of private investment and support at least 8,500 jobs.⁷² Until 2017 the Renewables Obligation - the predecessor to Contracts for Difference - will continue to provide support for some new renewables generation. Renewable electricity generation represents a significant opportunity for growth and investment in the UK's energy sector. New investors recognise this and are entering our market - such as DONG, Statkraft, Statoil, Vattenfall, Mainstream, EDPR and Repsol. Diversification of investors and developers on this scale is helping drive competition, cost reduction, investment and creates new sources of capital.

Moving from prices set administratively (the Renewables Obligation and early Contracts for Difference) to prices set by the market, via competitive auctions, will achieve the same level of low carbon generation from these technologies for less, ensuring that we deliver within the budget levels previously announced and deliver value for money for consumers. Government's ambition remains to move to competitive price discovery processes for all technologies as soon as practicable with the eventual aim of technology neutral auctions

Graph 1: New-build renewables asset finance in 2013 and % change on 2012

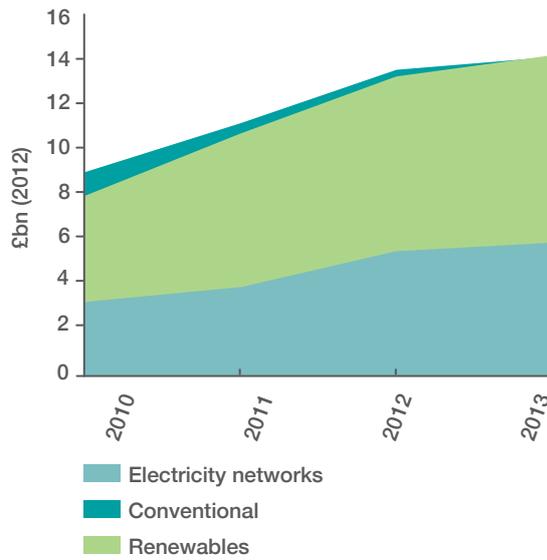


Source: Bloomberg New Energy Finance (US \$ bn).

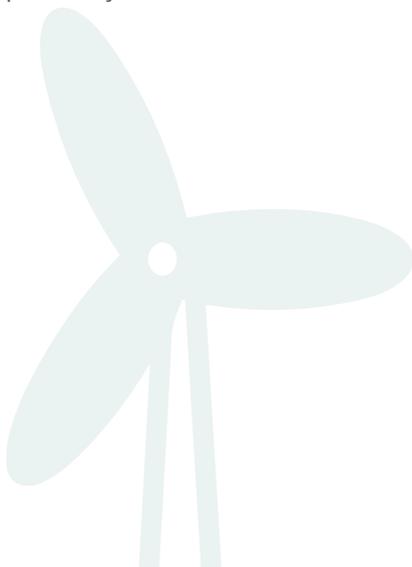
for all low carbon generation. Over time as technologies mature, we anticipate lower-cost technologies to gain larger market share and government support costs ultimately to be phased out.

The Capacity Market, and in the future carbon capture and storage, will ensure the continued role of gas – one of the most flexible and reliable sources of electricity, essential to ensuring we maintain security of supply. This needs to be complemented by investment in gas infrastructure to deliver safe, reliable, and affordable gas right across Great Britain. The Capacity Market includes a capped auction process to ensure the lowest possible cost to the consumer. The first auction is scheduled to take place in 2014, ensuring capacity is in place by Winter 2018.

Graph 2: Estimated annual electricity investment.



Source: DECC EMR Delivery Plan modelling.



By **2020**, up to **250,000 jobs** in low carbon generation could be supported by the UK's **Electricity Market Reforms**.⁷³

Since **2010**, an average of **£7 billion** has been invested each year in UK based **renewable energy**.⁷⁴

Table 1: Estimated investment in renewable electricity generation between 2010-2013, and 2014-2020

Renewable electricity generation technology	Estimated investment in renewable electricity generation capacity 2010-2013 (2012 prices)	Estimated investment in renewable electricity generation capacity 2014-2020 (2012 prices)
Onshore Wind*	£7.6bn	£3.7 – 5.8bn
Offshore Wind	£6.9bn	£16.2 – 21.3bn
Biomass and Bioenergy**	£6.3bn	£5.0 – 5.9bn
Tidal & Wave	£0.1bn	£0.4 – 0.5bn
Solar***	£6.4bn	£11.9 – 13.0bn
Hydro****	£0.2bn	£0.4 - 0.5bn
Other Renewable*****	£1.4bn	£2.2 – 2.4bn
Total	£28.9bn	£40-50bn

*Including large scale onshore wind, but excluding Scottish Islands onshore wind

** Including dedicated biomass, biomass conversions, bioliquids, energy from waste, anaerobic digestion (including small scale), advanced conversion technologies, landfill and sewage gas (including CHP variations of any of these technologies)

*** Including large and small scale solar PV

**** Including large and small scale hydro technologies

***** Including Scottish Islands onshore wind, small scale onshore wind, and geothermal (including CHP)

Source: DECC estimates based on EMR Delivery Plan modelling (Scenario 1)

Offshore wind

Building on our strengths

The UK has abundant supplies of wind energy, especially offshore. Our decision to proceed with a major expansion of offshore wind is based on a strategy of investing early in emerging low carbon technologies where the UK has real potential. We believe offshore wind will be key for expanding renewable electricity generation in the next decade, so it's important to drive costs down now.

Indeed, our investment in offshore wind has made the UK the world leader in this key renewable technology of the future.

The UK has more installed capacity (3.8GW) than the rest of the world combined. The world's largest offshore wind farm, London Array, has a capacity of 630MW and produces enough to power nearly 500,000 homes.⁷⁵ During construction, over 75 organisations helped to build London Array, with over 6,700 individuals involved. Up to 1000 people worked on site at the peak of construction.⁷⁶

Looking ahead, the UK market is rated as the most attractive place to invest in offshore wind in the world and major manufacturers are announcing new investments here. Maintaining this advantage is a government priority and represents a significant opportunity for investment and jobs to serve the domestic market, as well as building trade and export opportunities.

Siemens investing millions in the UK's favourable energy framework

Siemens and ABP Ports recently announced that they will invest £310 million in two new offshore wind turbine factories in Hull. This investment will support up to 1,000 direct jobs.⁷⁷

Offshore wind currently supports

18,300 jobs in the UK.



Greater Gabbard offshore wind farm. Courtesy of SSE

Offshore wind currently powers over 2 million UK homes.⁸⁰

The opportunity on offer

We have set out a package of Energy Market Reforms that can deliver a potential range of 8-15GW installed offshore wind capacity in Great Britain by 2020, with a clear pathway to 10GW, enough to power almost 7 million homes.⁷⁸ Higher levels of deployment are possible if costs fall more quickly. Cost reduction is key to the future potential of the sector.

The UK government is providing supply chains with the confidence to invest in offshore wind. The Green Investment Bank (GIB) is mobilising external capital into the sector and has recently invested £241 million alongside Japan's Marubeni Corporation to jointly purchase a 50% stake in the Westernmost Rough offshore wind farm from DONG Energy.⁸¹ Westernmost Rough is currently under construction and will mark the first commercial deployment of Siemens 6MW turbine and the first project in which the Green Investment Bank has taken construction risk in an offshore wind project.

We expect the cost of offshore wind to fall going forward and our support levels to reflect this. The strike price – the price to which government will pay a top up above the wholesale electricity price - falls over time.⁸² The expectation in industry is that strike prices will continue to fall in future years.

KEY FACTS: Offshore wind⁸³

Estimated Investment 2010-2013 (2012 prices)	£6.9bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£16.2 – 21.3bn
2012/13 employment level	18,300
Installed capacity at end of 2013 (GW)	3.7
Pipeline data (GW)	1.4 under construction, 4.3 awaiting construction 9.1 submitted
2020 deployment range (GW)	8 – 15

Nearly **5%**
of total UK electricity generated comes
from onshore wind.⁸⁴

Onshore wind

Building on our strengths

Onshore wind already accounts for a significant amount of the UK's total electricity generation (nearly 5% in 2013), enough to supply over 3 million homes.⁸⁵ We have a robust pipeline of projects, with 1.5GW currently under construction and 5.1GW awaiting construction.⁸⁶

Onshore wind is also providing jobs and support for local communities. For example, Keadby windfarm in north Lincolnshire, the largest windfarm in England, will provide £8.6 million to local communities over the next 25 years.⁸⁷ This follows a joint government-industry effort, whereby onshore wind developers have voluntarily introduced an industry wide protocol to pay local communities £5,000 per MW per annum. Combined with local jobs supported by the windfarm, this payment will ensure that local people see a real benefit.

As one of the most established and cost effective renewable technologies, onshore wind has grown rapidly in the UK, helped by a stable investment framework, significant cost reductions and a healthy pipeline. Costs of onshore wind have been coming down, which has been reflected in the reduction of support levels required to bring forward onshore projects.⁸⁸

Existing UK onshore wind projects have already attracted a significant level of secondary investment. For example, The Renewables Infrastructure Group Limited recently bought two operational wind farms, the Tallentire wind farm (which came online in May 2013) and the Meikle Carewe scheme in Scotland (which came online in July 2013), from developer RES. These purchases add 22MW to the TRIG portfolio, for an "aggregate consideration" of £19.1 million.⁸⁹

Community benefits from Tallentire wind farm

Completed in 2013, Tallentire wind farm (near Cockermouth, Cumbria) is made up of six wind turbines. Over the lifetime of the wind farm:

- **£3.9 million** will be paid to the local council in business rates for reinvestment back into the local community.
- Local residents qualify for a **£108** discount off their annual electricity bill, without having to switch their energy supplier.⁹⁰

The opportunity on offer

Because of the maturity of this sector and the strength of the pipeline, the government will introduce competitive allocation of financial support under Contracts for Difference from October 2014. Requiring projects to compete in auctions for financial support will ensure that only the best value projects are taken forward – securing the investment needed to meet our 2020 renewables targets whilst ensuring value for money for consumers.

KEY FACTS: Onshore wind ⁹¹	
Estimated Investment 2010-2013 (2012 prices)	£7.6bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£3.7 – 5.8bn
2012/13 employment level	17,100
Installed capacity at end of 2013 (GW)	7.3
Pipeline data (GW)	1.5 under construction, 5.1 awaiting construction, 6.5 submitted
2020 deployment range (GW)	11 - 13

Onshore wind supports **17,100** jobs
in the UK.⁹²



Government expects **onshore wind** to power up to **7 million homes** by **2020**.⁹³



Solar PV

Building on our strengths

UK solar PV is one of the most rapidly growing markets in Europe. The UK's total capacity grew by almost 1,000MW (60%) in 2013 alone. We had 2.7GW installed capacity in total at the end of 2013, enough to power 500,000 homes.⁹⁴ This puts the UK firmly in the global top ten economies for deployed solar. The sector has demonstrated its ability to deploy at all scales, from domestic and commercial buildings to large utility scale facilities.

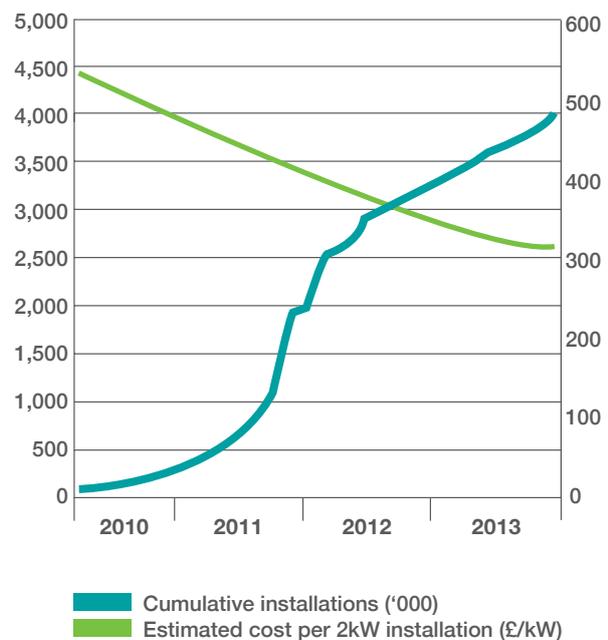
The world's largest solar bridge located in the UK

London's new Blackfriars Station is the world's largest solar bridge with more than 4,400 solar photovoltaic panels installed. These solar panels provide 50% of the station's energy.⁹⁵

Solar PV deployment can be seen across the country. Jaguar Land Rover recently installed the UK's largest rooftop system at its Engine Manufacturing Centre in the West Midlands. This array will generate over 30% of the site's total energy requirements – the equivalent

to powering more than 1,600 homes.⁹⁶ Similarly, solar PV will provide enough on-site generation to power 40% of the electricity needs of Bentley Motors' factory in Crewe⁹⁷ and 20% of Sainsbury's Hams Hall Distribution Centre in Birmingham.⁹⁸

Graph 3: Estimated cost (historic and projected) of small-scale solar PV installations and number of installations.²³⁷



In 2013, UK's **solar PV capacity**
grew by **60%**.⁹⁹



Solar bridge on roof of Blackfriars station, England.

Between **2010-2013** a total of **£6.4 billion** of private sector investment in **solar PV**.¹⁰⁰

The opportunity on offer

The solar PV sector is aiming for more ambitious and sustainable deployment, to achieve cost reductions in order to deliver 11-12GW of capacity by 2020.¹⁰¹

We see the future of the industry in the UK centred primarily to two key markets:

- small-scale building mounted panels, typically on housing, small commercial premises and community buildings;
- commercial and industrial buildings, larger public and community buildings.

The government is taking steps to support both sectors by removing non-financial barriers and, tackling grid issues. We are also setting an example to follow by committing to install 1GW of solar capacity across the public sector estate.¹⁰²

KEY FACTS: Solar PV¹⁰³

Estimated Investment 2010-2013 (2012 prices)	£6.4bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£11.9 – 13.0bn
2012/13 employment level	15,600
Installed capacity at end of 2013 (GW)	2.7
Pipeline data (GW)	0.6 under construction, 1.5 awaiting construction, 1.4 submitted
2020 deployment range (GW)	11 - 12

We have ring-fenced revenue support for **100MW** worth of wave and tidal stream up to **2019**.¹⁰⁴

Wave, tidal stream and tidal range

Building on our strengths

The UK is the world leader in the development of the emerging wave and tidal stream sectors¹⁰⁵, both of which have the potential to develop into large global markets. With the second largest tidal range in the world, the UK is also well placed to benefit from this reliable and predictable energy source, through construction of tidal lagoons and barrages.¹⁰⁶

The wave technology sector has already received investment. Over the past ten years Pelamis Wave Power has attracted more than £40 million¹⁰⁷ in private investment, £10 million from government grants and has generated £20 million in sales.

Driving forward individual development

In 2013, the UK's first tidal stream test facility and assembly plant opened in Bristol and is now developing leading-edge drive train technology for key tidal array developments in the UK. The facility employs around 25 permanent staff, which builds on the Siemens' Marine Current Turbines (MCT) 50-strong workforce. The facility will help to develop the Siemens' MCT first array projects, including the 10 MW Skerries project in Wales.

The array projects build on the success of the sector leading Siemens SeaGen MCT technology deployed since 2008 in Strangford Lough, Northern Ireland. SeaGen has now produced over 9 GWh of electricity.¹⁰⁸

The wave and tidal stream energy sector currently employs **600** people.¹⁰⁹

The opportunity on offer

Both the wave and tidal stream sectors are at the pre-commercialisation stage so the challenge is to provide sufficient confidence to attract the investment required to develop further. The government has taken a number of steps to provide this confidence including:

- Ring-fencing a protected allocation of 100MW worth of revenue support for wave and tidal stream up to 2019¹¹⁰;
- Innovation grant through the Marine Energy Array Demonstrator fund for, pre-commercial wave and tidal stream array projects¹¹¹, and;
- Providing testing facilities for the development of wave arrays, for example, the WaveHub facility in Cornwall.¹¹²

KEY FACTS: Wave and tidal ¹¹³	
Estimated Investment 2010-2013 (2012 prices)	£0.1bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£0.4 – 0.5bn
2012/13 employment level	600
Pipeline data (GW)	0.2 awaiting construction, 0.3 submitted
2020 deployment range (GW)	c.0.1



SeaGen Tidal Current Turbine in Strangford Lough, Northern Ireland. Courtesy of Siemens www.siemens.com/press

Biomass and bioenergy

Building on our strengths

Biomass, when sourced sustainably, can provide a cost-effective, low carbon and controllable source of renewable energy. Our priorities for supporting biomass electricity and heat generation are to make the best use of our biomass resources.

Power plant conversions from fossil fuel to using biomass are playing their part as a transitional technology as we move to decarbonise the electricity sector. Drax has started the partial conversion of its coal power station under the Renewables Obligation. Under the FID Enabling for Renewables process, two biomass conversion projects have been awarded Investment Contracts (an early form of Contracts for Difference). All plants are making significant investments in supply chain infrastructure.¹¹⁴

Anaerobic Digestion (AD) is a growing sector within the UK energy market and the Coalition Agreement set out a government commitment to increase deployment. It provided 676GWh of electricity to the national grid in 2013, an increase of 153GWh over the year.¹¹⁵ We have an aspiration of around 0.5-0.6GW of Anaerobic Digestion deployment (including large and small scale) by 2020.

Most recently, construction has started on an Anaerobic Digestion plant in Enfield, north London, which will generate 7.4GWh of power per year and is expected to become operational in the Spring 2016. The plant has received £7.5 million worth of investment from the UK Green Investment Bank. The investment is being made by the Foresight-managed U.K. Waste Resources and Energy Investments. Foresight will invest another £7.5 million through its Foresight Environmental Fund.¹¹⁶

Yorkshire based firm benefiting from biomass conversion

Shepherd Group, a construction and engineering company based in Yorkshire, was awarded a £50 million contract to design and build the new biomass storage and handling facilities at Drax Power Station.

Biomass, when sourced sustainably, can provide a cost-effective, low carbon and controllable source of **renewable energy**.



Drax Power Station, England. Courtesy of Drax media resources.

By **2020**, biomass could provide power equivalent to **10%** of the UK's current electricity supply, enough for around **8 million homes**.¹¹⁷

The opportunity on offer

Looking ahead to future investment opportunities, biomass Combined Heat and Power is a priority area. A large 299MW project (MGT, Teeside) has secured an Investment Contract and there are a number of smaller projects in the pipeline.

Investment in dedicated biomass for electricity production can still come forward under our cap of 400MW under the Renewables Obligation. In 2013, Brigg Renewable Energy Plant and Blackburn Meadows Renewable Energy Plant (totalling 73.5MW) made final investment decisions and intend to come forward under the Renewables Obligation.¹¹⁸

Advanced conversion technologies (ACT) are being developed in the UK utilising gasification and pyrolysis. The challenge for the sector is making the move to become a commercially established technology. The government is helping to provide a stable framework for investment, for example through the Renewables Obligation and Contracts for Difference.

KEY FACTS: Biomass and bioenergy¹¹⁹

Estimated Investment 2010-2013 (2012 prices)	£6.3bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£5.0 – 5.9bn
2012/13 employment level	Up to 14,700
Installed capacity at end of 2013 (GW)	4.1
Pipeline data (GW)	0.8 under construction, 3.8 awaiting construction, 0.6 submitted
2020 deployment range (GW)	ACT (with or without CHP) – c0.2-0.3 Large Scale AD (with or without CHP) – c0.3-0.4 Biomass Conversions – 1.7-3.4 Dedicated Biomass with CHP – c0.3-0.6 EfW with CHP – c0.4

Hydropower

Building on our strengths

Hydropower has been a generator of renewable electricity in the UK since the 1950s, and accounts for approximately 1.5% of total electricity generation today. Most suitable sites for large-scale hydro in the UK have already been utilised.

Hydro scheme generating local power

Osney Lock Hydro is a 49 kW community hydro-electricity scheme which has raised over £530,000 from local people. The electricity from hydro scheme will be supplied locally. The scheme is aiming to generate over £2 million during its forty year lifetime with this money being used to fund energy demand reduction programmes and support biodiversity in West Oxford.¹²⁰

The opportunity on offer

Investment opportunities still exist. A number of sites need to be refurbished and operators of these facilities will be seeking support from investors.

The government is providing support for those who wish to tap into this potential, in particular at community level. Over 300 hydro installations with total capacity of 45 MW have already accredited under the Feed in Tariffs (FITs) scheme in four years.¹²¹

There are significant opportunities in small-scale hydro. Studies in Scotland and England and Wales indicate that there is a maximum remaining potential of around 1 - 2.5GW to be exploited.¹²²

KEY FACTS: Hydropower¹²³

Estimated Investment 2010-2013 (2012 prices)	£0.2bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£0.4 - 0.5bn
2012/13 employment level	5,000
Installed capacity at end of 2013 (GW)	1.7
Pipeline data (GW)	0.1 awaiting construction
2020 deployment range (GW)	c1.8

A photograph of the Craig Goch reservoir dam in the Elan Valley, Wales. The dam is a large, multi-tiered stone structure with several spillways. Water is cascading down the spillways, creating a white, frothy appearance. The sky is clear and blue. The text is overlaid on a dark, semi-transparent rectangular area in the upper half of the image.

5,000 jobs

supported by **hydropower** in the UK.¹²⁴





Computer generated aerial view of Hinkley Point C nuclear power station, England. Courtesy of EDF Energy.

Nuclear

Building on our strengths

Nuclear power's contribution to the UK power generation is more than five times the domestic consumption of greater London.¹²⁵

Nuclear power currently provides 20% of the UK's electricity and employs around 40,000¹²⁵ people across the primary nuclear sub-sectors - waste management and decommissioning, the operation of existing nuclear power stations and fuel cycle plant.

With a strong regulatory framework and the potential for delivering low carbon electricity, the UK is well positioned to reap the benefits from a new generation of nuclear power stations, transitioning from a market dominated by the operation and life extensions of existing reactors built over 20 years ago.

In 2013 the government granted development consent for construction of the first nuclear power station in the UK since 1995 at Hinkley Point in Somerset, and also agreed the key terms for the associated investment contract. This £16 billion project has a capacity of 3.2GW, able to provide around 7% of the UK's electricity demand from a low carbon

source and enough to supply over 5 million households. This major investment in our economy would support 25,000 jobs. EDF estimate that £40 million per year will go into the regional economy reaching over £2 billion over the lifetime of the project.¹²⁷

Following its acquisition of Horizon Nuclear Power in 2012, Hitachi plan to deploy their new reactors at Wylfa on the Isle of Anglesey, and later in Oldbury, Gloucestershire. This would bring an estimated total investment of approximately £20 billion across both sites. We anticipate first electricity generation at Wylfa to take place during the first half of the 2020s as well as up to 1,000 jobs supported per site when the plants begin operations.¹²⁸

In May 2014 Toshiba and GDF Suez committed investment of £200 million to progress development plans for a new nuclear plant at Moorside in Cumbria. This would deliver £10 billion of investment into the UK and support up to 21,000 jobs over the construction period, including peak on-site employment of more than 6,000 people.¹²⁹

The new **Hinkley power station** could generate power for over **5 million homes.**¹³⁰

KEY FACTS: Nuclear ¹³¹	
Estimated Investment 2010-2013	Approximately £2bn
EMR Delivery Plan Estimated Investment 2014-2020 (2012 prices)	£10-£12bn
2012 employment level	Around 40,000
Installed capacity at end of 2013 (GW)	10GW
Pipeline data (GW)	Up to 16GW by 2030

The opportunity on offer

As existing nuclear power stations start to come to the end of operational lives, a new fleet is required to replace them. In the UK, industry has set out plans to deliver around 16GW of new nuclear by 2030.¹³² This represents a significant programme of infrastructure new build in the UK.

The government is committed to finding a way that will enable investors to deliver a programme of new build and has reformed the electricity market system accordingly to make this possible. The Nuclear Industry Association (NIA) estimate that the 16GW ambition would require some 200,000 man years of effort, with a peak requirement of around 30,000 people and lead to around 5,000 permanent jobs for plant operations.¹³³

Managing our nuclear waste legacy is a priority for the government and responsibility for decommissioning and clean-up of 17 nuclear sites falls to the Nuclear Decommissioning Authority (NDA), which through contracting significant work programmes to Site License Companies, effects significant economic activity in this field and provides major opportunities for business.¹³⁴

Nuclear power's contribution to the **UK** power generation is more than **five times** the domestic consumption of **Greater London**.¹³⁵

Carbon capture and storage

Building on our strengths

Carbon capture and storage (CCS) will revolutionise the way that we are able to use fossil fuels for electricity generation and industrial process heat generation, creating a new option for low carbon electricity and heat.

Fossil fuel power stations currently provide around 60% of the UK's electricity.¹³⁶ Going forward, the UK will increasingly need to decarbonise its electricity system and heavy industry. Up to 13GW of carbon capture and storage may be needed by 2030. This level of deployment could provide over 20% of the UK's electricity in 2030. The CCS industry could support between 15,000-30,000 jobs.¹³⁷

Putting in place CO₂ Transport and Storage infrastructure – as part of government's programme of support to the carbon capture and storage sector, could allow clusters of power stations and heavy industry to significantly reduce their emissions.

The UK has now positioned itself as a world leader in this innovative sector and is the only country in Europe with two commercial scale carbon capture and storage projects in development, at Peterhead in Scotland, and White Rose, in Yorkshire.

These low carbon energy projects have £1 billion of government funding to support their development and construction, plus revenue support via Contracts for Difference under our Electricity Market Reform framework. It is estimated that they will support more than 2,000 jobs during construction and will generate enough clean electricity for more than 1 million homes.¹³⁸

As a further demonstration of commitment to this sector, in 2014 government announced £60 million for new low carbon innovation to support CCS technologies that show significant potential to reduce the cost of low-carbon generation in the UK.

Carbon capture and storage could support between **15,000-30,000 jobs.**

The opportunity on offer

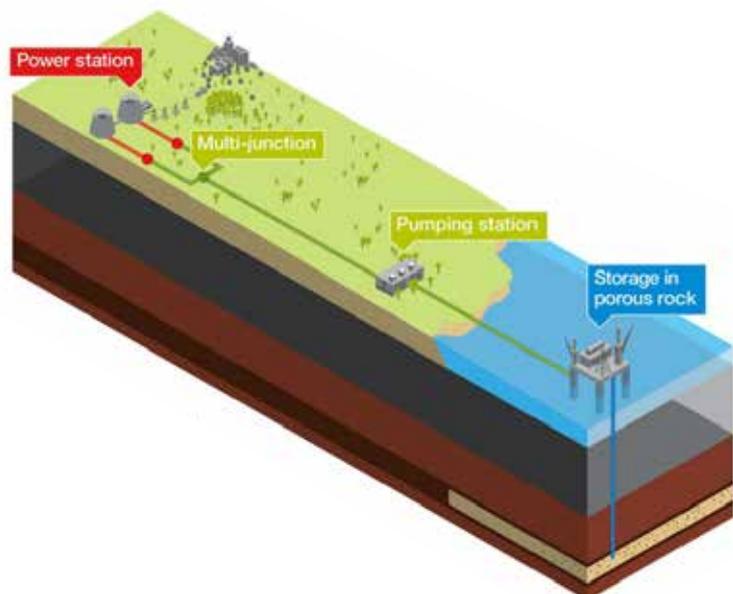
Beyond the two projects under the Commercialisation Programme, there are several other carbon capture and storage projects at various stages of maturity.

The CCS industry also calculates that the Gross Added Value benefits in the UK are in the region of £2 billion–£4 billion per year by 2030 with a cumulative market value of £15 billion–£35 billion.¹³⁹ This value could increase if the UK were to take a share in the global CCS market which the International Energy Agency has projected could reach 964GW by 2050, creating a global market worth over £100 billion, much of it in developing countries.

National Grid graphic demonstrating the CCS process

- Capture technology
- Pipeline transportation
- Storage in porous rock

Illustrative and not to scale





Shoreham Power Station, England.

Gas generation

Building on our strengths

Gas is an integral part of the UK's electricity generation mix and will continue to be so over the coming decades as we decarbonise our electricity system. It is the cleanest fossil fuel and to one of the most flexible and reliable sources of electricity.

As of May 2013, there was around 33GW of gas-fired electricity generating capacity in the UK (Major Power Producers).¹⁴⁰ Gas-fired power stations provided 27% of our electricity in 2013.¹⁴¹ The UK has already demonstrated the capability for significant investment in gas generation plant and infrastructure with approximately 28GW of new gas plant completed or commissioned between 1991 and 2010.¹⁴²

Table2: Gas generation projects with consent.

Plant	Operator	Gross Capacity (MW)
Abernedd	SSE	470
Barking	Barking Power	470
Carrington II	Wainstones Energy	1,520
Cockenzie	Scottish Power	1,000
Damhead Creek II	Scottish Power	1,000
Drakelow D	E.ON	1,220
Gateway Energy Centre	Intergen	900
Hatfield Park	Powerfuel Power	900
Keadby II	SSE	710
Kings Lynn B	Centrica	1,020
Norsea Pipelines	Seal Sands, Teeside	800
Spalding	Intergen	900
Thor Cogeneration	Seal Sands, Teeside	1,020
Thorpe Marsh	Thorpe Marsh Power	1,500
Willington C	RWE	2,400
	Total	15,830

Gas-fired power stations provided
27% of the UK's electricity in **2013**.¹⁴³

The opportunity on offer

Up to 25GW of new gas plant may be needed between 2014 and 2030, to replace older plant and act as backup for variable renewables generation and meet peak electricity demand.¹⁴⁴ As of May 2014, there was around 16GW of gas plant with planning consent and an additional 6GW awaiting a consent decision.¹⁴⁵

We fully support the development of this industry as a key contributor to meeting the UK's energy needs. The Capacity Market and powers taken in the Energy Act 2013, will maintain security of supply and improve wholesale market liquidity in the future as necessary, as well as proposals to improve the planning regime for generating plants. We are procuring a total of 53.3GW of capacity for the first capacity year in 2018/19. Added to the capacity that will also be coming online from low carbon sources, this is the amount we need to keep the country's lights on in 2018/19.

In the longer term, the development of cost-competitive carbon capture and storage should ensure gas can continue to play a

full role in a decarbonised electricity sector. Power plant with carbon capture and storage could reduce CO₂ emissions to the atmosphere by approximately 80–90% compared to a plant without carbon capture and storage. Our programme of support is one of the most comprehensive offered by any country in the world.

KEY FACTS: Gas generation¹⁴⁶

Estimated Investment 2010 - 2013 (2012 prices)	£2.5bn
EMR Delivery Plan Estimated Investment 2014 - 2020 (2012 prices)	£4.1 -4.7bn
2014-2030 (GW)	16 -25
Installed capacity at end of 2013 (GW)	32
Pipeline data (GW)	16 planning 6 awaiting consent
2020 deployment range (GW) – total gas capacity	33 GW

Oil and gas, and shale

Domestically produced oil and gas remain an essential part of the UK's energy mix and reduce our dependence on imported fossil fuels. It is essential to fully utilise our existing resources.

Around 42 billion barrels of oil equivalent (boe) have been produced from the UK Continental Shelf (UKCS) to date and up to 20 billion boe could still be developed, presenting opportunities for future investment.

Shale oil and gas could offer Britain the opportunity to produce even more home-grown energy. To promote this industry, the government has facilitated introduction of an industry led community benefits package for people living near shale sites worth £100,000 per exploratory site, plus 1% of revenues.¹⁴⁷

Combining future investment in our own oil and gas reserves, including the emergence of shale, with the transition to low-carbon energy and improved energy efficiency will maintain the UK's position as one of the most energy secure countries in the world.

To ensure that the regulatory environment supports maximum economic recovery of UK hydrocarbons, the government has endorsed and is implementing the recommendations of the recent Wood Review. This includes the establishment of a new, independent and well-resourced regulator, the Oil and Gas Authority.¹⁴⁸ Sir Ian Wood's report estimates that full and rapid implementation could be worth over £200 billion over the next 20 years.¹⁴⁹

The downstream oil industry supports 30,000 jobs in the UK, and contributes an estimated £2.3 billion to GDP.¹⁵⁰ A mix of domestic refining and imports is good for UK energy resilience.¹⁵¹

Industry estimates suggest the **upstream oil and gas** sector supports the employment of nearly **450,000** people across the UK.¹⁵²



Buzzard field, North Sea. Courtesy of BG Group

£3.7 billion

investment in shale gas is possible up to 2032, supporting 60,000 jobs.¹⁵³

Upstream oil and gas

Building on our strengths

The UK's upstream oil and gas exploration and production (E&P) industry has been a major investor and contributor to UK energy supplies for many years. In 2013, UK oil production was equivalent to 62% of UK oil product demand while UK gas production was equivalent to 50% of gross UK gas demand.¹⁵⁴ Investment in new and existing fields has risen significantly in recent years, and is at record levels in real terms.

Direct employment in the E&P industry is at around 35,000, but the scale of industry expenditure (with operating costs running at around £9 billion a year) directly and indirectly supports a much higher level of employment across the economy.¹⁵⁵

Greater Catcher provides UK investment boost

The government has approved the development of Premier Oil's operated Greater Catcher Area. It is the largest of three new field projects to be approved so far on the UK Continental Shelf (UKCS) in 2014.

Key facts:

- First production is expected in 2017.
- In 2018 this area is likely to deliver 47,000 barrels of oil equivalent per day.
- Development costs are expected to be over US\$2 billion.

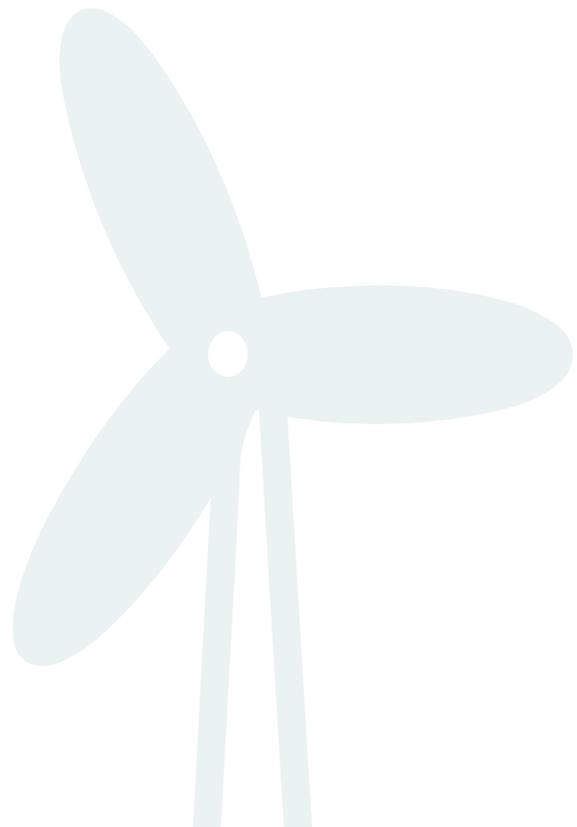
The development is a key growth project for both Premier Oil and Cairn Energy.¹⁵⁶

The opportunity on offer

Now more than ever Britain needs more home-grown energy. Shale gas and oil represents a huge economic opportunity for local communities. UK investment could reach £33 billion between 2016 and 2032 or £3.7 billion a year and support around 60,000 jobs in the oil, gas, construction, engineering and chemicals sectors.¹⁵⁷ In 2013, we introduced the most competitive tax regime in Europe for shale gas and oil. Local councils will retain 100% of the business rates they collect from productive shale gas and oil developments, worth up to £1.7 million a year for a typical 12 well site. Major operators, including Centrica,¹⁵⁸ Total¹⁵⁹ and GdF Suez, have announced investments in projects in the sector, partnering with licence-holders.¹⁶⁰

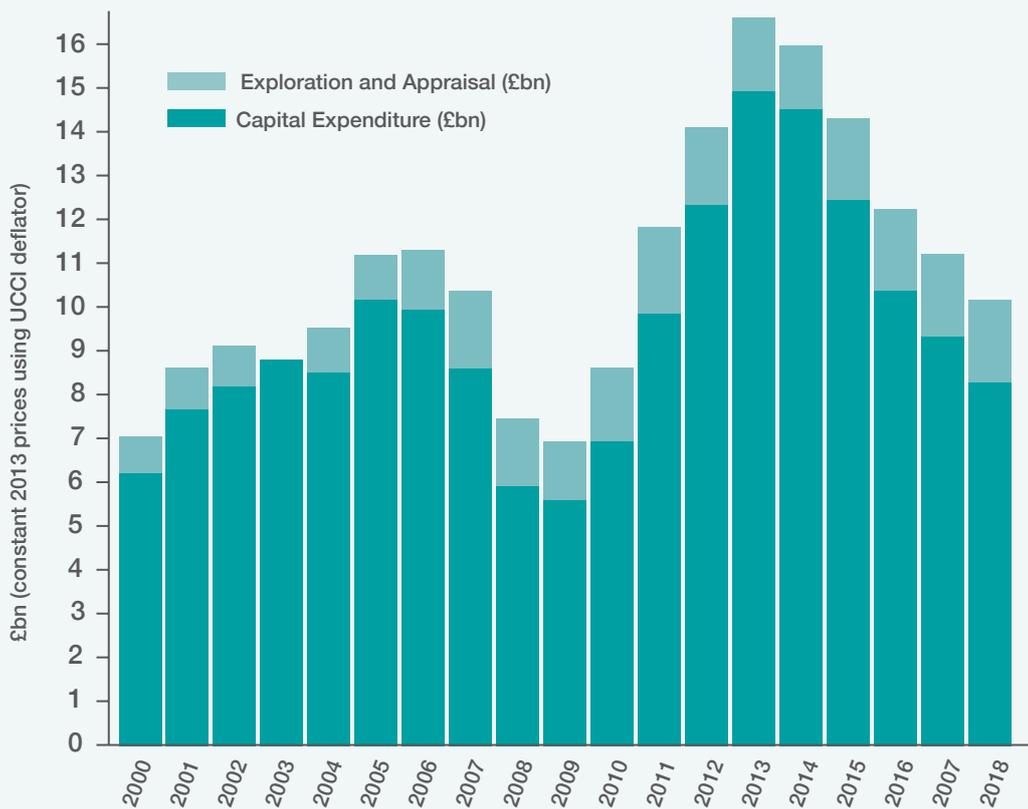
The investment chart (Graph 3) shows the increased levels of investment in both development expenditure (Capex) and exploration and appraisal (E&A) expenditure on the Continental Shelf since 2009 with 2013 being a significant year.

Projected spend is shown in constant 2013 prices and past spend has been put into 2013 prices using a sterling version of the industry-specific IHS CERA Upstream Capital Cost Index (UCCI).



20 billion barrels of oil equivalent could still be developed, presenting opportunities for future investment.¹⁶¹

Graph 3: Actual/Projected UKCS Capital Expenditure



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Capex	6.0	7.4	7.9	7.7	8.2	9.8	9.6	8.3	5.7	5.4	6.7	9.5	11.9	14.4	14.0	12.0	10.0	9.0	8.0
E&A	0.8	0.9	0.9	0.8	1.0	1.0	1.3	1.7	1.5	1.3	1.6	1.9	1.7	1.6	1.4	1.8	1.8	1.8	1.8

Source: Actual spend – Income from and expenditure on UKCS exploration, development and operating activities: annually 1970-2012. Projected spend – UKCS capital expenditure survey 2013.

30,000

The number of jobs supported by the UK's **downstream oil** industry.¹⁶²

£2.3 billion

Estimated contribution of **downstream oil** to GDP.¹⁶³

Downstream oil

Building on our strengths

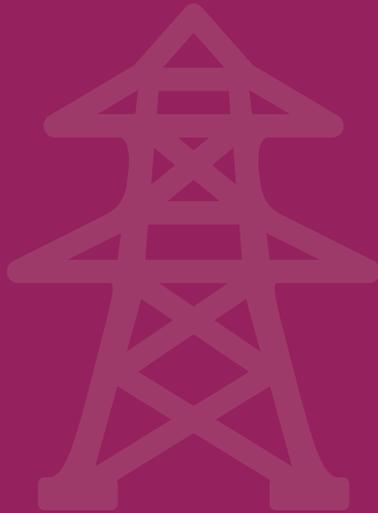
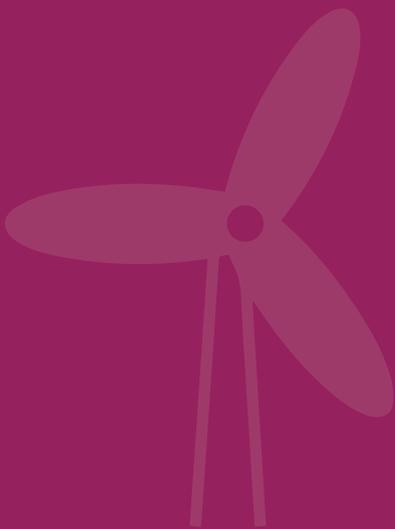
The government undertook a review of the UK's refining and fuel import sectors in April 2014, and considered how industry and government can work together to ensure a resilient fuel supply chain going forward. The downstream oil industry is important for the country, directly supporting nearly 30,000 jobs in the UK, and contributing an estimated £2.3 billion to GDP.¹⁶⁴

The opportunity on offer

Despite the long term reduction in refinery capacity throughout Europe, and fewer conventional new builds, it is possible that new applications or process designs based on a new business model could attract investment.

This has already been shown with Solena Fuels and British Airways announcing the building of the world's first facility to convert landfill waste into jet fuel at Thames Enterprise Park. The sustainable jet fuel produced each year will be enough to power BA's flights from London City Airport twice over with carbon savings the equivalent of taking 150,000 cars off the road.¹⁶⁵

Energy networks



Electricity networks, infrastructure and interconnection

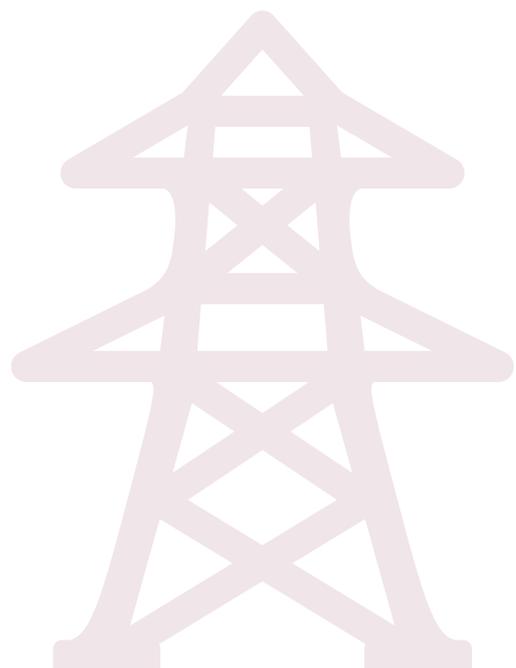
Building on our strengths

Strengthening our electricity networks is critical for maintaining energy security and ensuring we can meet our wider energy objectives. Investment is needed to ensure our networks can accommodate new generation and cover the cost of replacing or upgrading ageing existing infrastructure. It will also enable us to modernise our network so we have a smarter grid and support greater levels of interconnection with other parts of the EU.

Over £16 billion has already been invested in onshore and offshore electricity networks since 2010¹⁶⁶. Interconnection projects valued at around £1 billion have also been delivered since 2010¹⁶⁷. This brings Great Britain's (GB) current interconnection capacity to 4GW, which is equivalent to around 5% of installed GB generation capacity.¹⁶⁸ Government is committed to increasing interconnection, with projects in the pipeline aiming to more than double GB capacity - this will make Britain more energy secure with the potential also to lower prices.

Onshore, Transmission Owners are currently constructing major projects worth around £2.4 billion to deliver 11GW of network capacity by the end of 2016. Of this, nearly 4GW is due to be completed between 2014 and 2015.¹⁶⁹

Offshore, our innovative and competitive approach has secured around £1.4 billion of investment from the nine Offshore Transmission Owners appointed since 2010. This has delivered around 2.4GW of capacity and there is approximately 1.9GW of assets worth about £1.5 billion in the tender process.¹⁷⁰



Over **£16 billion** has already been invested in onshore and offshore **electricity networks** since 2010.¹⁷¹

The opportunity on offer

Government policy and regulatory oversight is helping to ensure predictable and attractive long-term investment opportunities in this sector. Around £35 billion of investment in onshore and offshore networks may be needed to 2020. The government has signalled support for around 6GW of further interconnection projects to benefit from EU priority status.¹⁷² This would represent a 150% increase on GB's current capacity.¹⁷³

Electricity network companies currently employ over 20,000 people and Ofgem estimate over 8,000 further jobs will be supported to 2021 in the electricity transmission sector alone.¹⁷⁴

Investment in Western Link

Around £200 million has been invested to date in the £1 billion Western Link joint venture between National Grid and Scottish Power Transmission. The link will bring renewable energy from Scotland to homes and businesses in England and Wales via a 420km, 2.2GW High Voltage Direct Current subsea cable from Hunterston in Scotland to Deeside in Wales.¹⁷⁶





The **£1.2 billion investment** in the National Transmission System to **2021**, will support up to **4,500 jobs**.

The **£6.4 billion** capital investment in electricity distribution to **2021** will support **10,000 jobs**.¹⁷⁷



Gas networks and infrastructure

Building on our strengths

Investment in gas infrastructure is required to deliver safe, reliable, and affordable gas across Great Britain.

This gas is landed from our North Sea resources or from import points from international suppliers. The UK uses this gas in power stations, industry, and for heat in our homes and businesses.

Between 2010 and 2014, around £1 billion was invested in new gas storage and import infrastructure, supporting around 70 jobs.¹⁷⁸ This included capital expenditure on five gas storage sites and one liquefied natural gas (LNG) terminal.

Around £300 million was spent to ensure the continued safety and reliability of the National Transmission System (NTS), supporting on average around 4,000 jobs¹⁷⁹ each year.¹⁸⁰ National Grid is responsible for the upkeep of the NTS, the arterial gas system which transports large volumes of gas across the country to the distribution networks and major consumers, like power stations.

Four regional network operators are responsible for the maintenance and development of the eight capillary-like distribution networks, which takes gas from the NTS to our homes and smaller businesses. These companies, operating across the UK, spent around £3.5 billion between 2010 and 2014, supporting on average 7,500 jobs a year.¹⁸¹

London Reinforcement Project

National Grid is undertaking a £3.2 billion investment programme across London, beginning with replacing Victorian gas mains, as part of a wider gas mains replacement programme across London.¹⁸²

Between **2010** and **2014** more than **£3.8 billion** invested in **gas transmission** and **distribution networks**, which supported around **11,500 jobs**.

The opportunity on offer

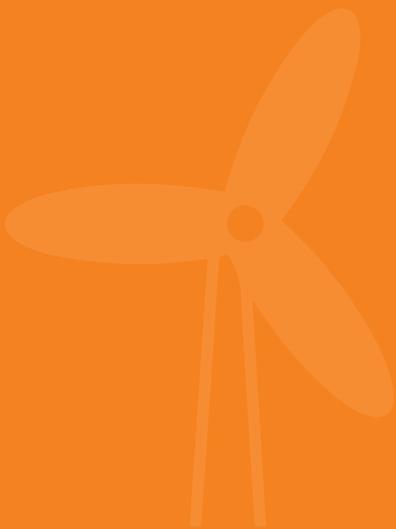
The changing pattern of both demand and supply presents a significant challenge and opportunity to the UK's gas infrastructure. As North Sea gas production declines, there is an increasing need for south-to-north gas transmission, while electricity generation from gas is set to become increasingly variable as renewable generation grows.

As we look to the future, gas will continue to be an important part of the energy mix to 2030 and beyond. The continued importance of imports, potential for new gas suppliers to enter the UK market, and emerging role of gas in shipping and heavy goods transport present significant opportunities for investors in import infrastructure and storage.

The continued need for a gas transportation system has seen Ofgem approve National Grid's £1.2 billion investment in the NTS between now and 2021, which is forecast to support around 4,500 jobs a year. Similarly, Ofgem has permitted distribution companies to spend more than £6.4 billion for capital investment in their networks, which could support around 10,000 jobs a year between now and 2021.¹⁸³

Government is also aware of significant levels of further investment in gas storage and import infrastructure which could come forward over the coming years, including plans for expansion at existing LNG terminals or construction of new ones and 11 gas storage projects which already have planning permission.

Heat



Heat

Building on our strengths

Heat is the single biggest reason we use energy. The UK uses more energy for heating than for the generation of electricity or transport. Nearly half the energy used in the UK is for heating, including over 60% of all gas consumed.¹⁸⁴

The government sees significant opportunity and is investing in the industry through activities such as high-quality renewable heating training for heating engineers in the UK, a supportive tax environment to bring forward investment in renewable and natural gas fuelled Combined Heat and Power systems (around £5 billion, between now and 2020)¹⁸⁵ and £6 million supporting the early stage development of over 50 district heat network projects in towns and cities in England and Wales.

The UK has the world's largest market for high efficiency condensing gas boilers, driven by simple, effective building regulations. Over 70% of UK gas boilers sold were manufactured in the UK.¹⁸⁶

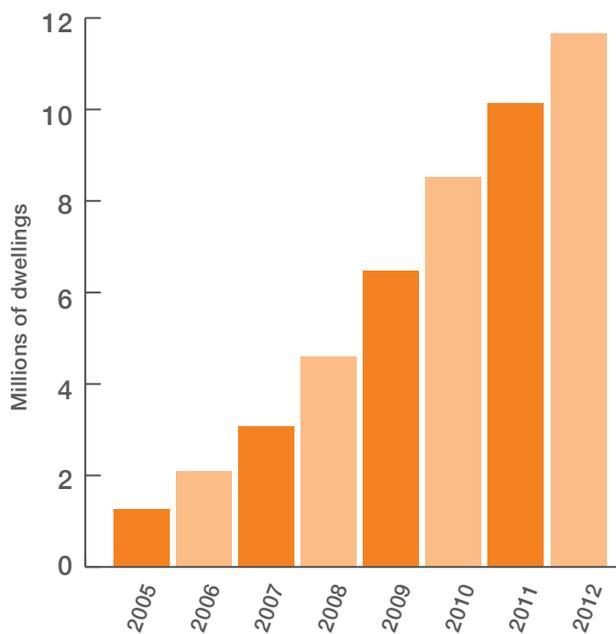
UK householders spend over £3.75 billion a year on new gas boilers for their homes, supporting the jobs of over 100,000 registered GasSafe engineers.¹⁸⁷ In 1990, no homes had high-efficiency condensing boilers. Now 44% of homes do¹⁸⁸ – and we project that a further 10 million gas boilers will be replaced in homes between now and 2020, almost all of them with condensing boilers, saving each household from around £20 to £120 or more per year.¹⁸⁹

The opportunity on offer

This means that there is an enormous investment opportunity for new and renewable forms of heating, such as heat pumps and heat networks, and more efficient traditional heating technologies including Combined Heat and Power and gas boilers; in addition to investment in infrastructure to support the supply of heat.

There are also excellent opportunities in both manufacturing heating systems and training heating system installers.

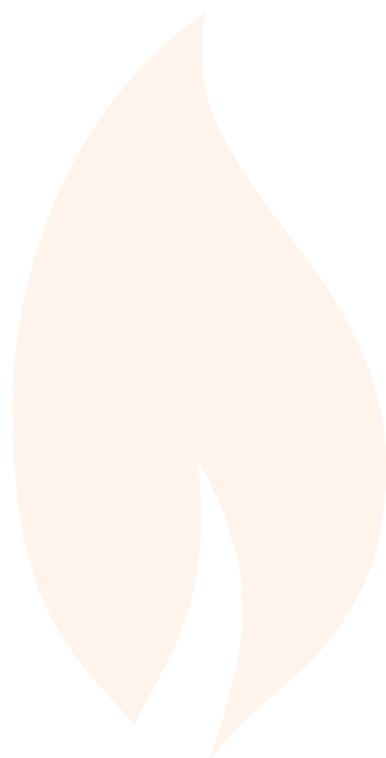
Graph 4: Number of dwellings with high efficiency condensing gas boilers



Source: English Housing Survey.

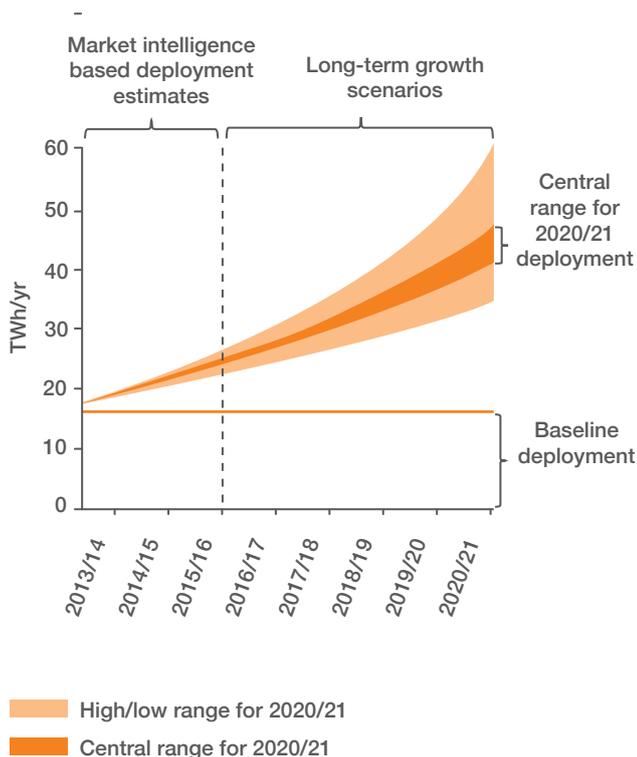
The renewable heat market has enormous potential to grow. The Renewable Heat Incentive (RHI) provides support for renewable heating systems in homes, and in the commercial, industrial, public and third sectors.

We estimate that the domestic Renewable Heat Incentive would require around £3 billion of investment in new, lower carbon, heating systems between now and 2020. This is to achieve the 30% annual growth rates we estimate are possible, supporting up to 5,000 jobs by 2020.¹⁹⁰



UK householders spend over £3.75 billion a year on new gas boilers.¹⁹¹

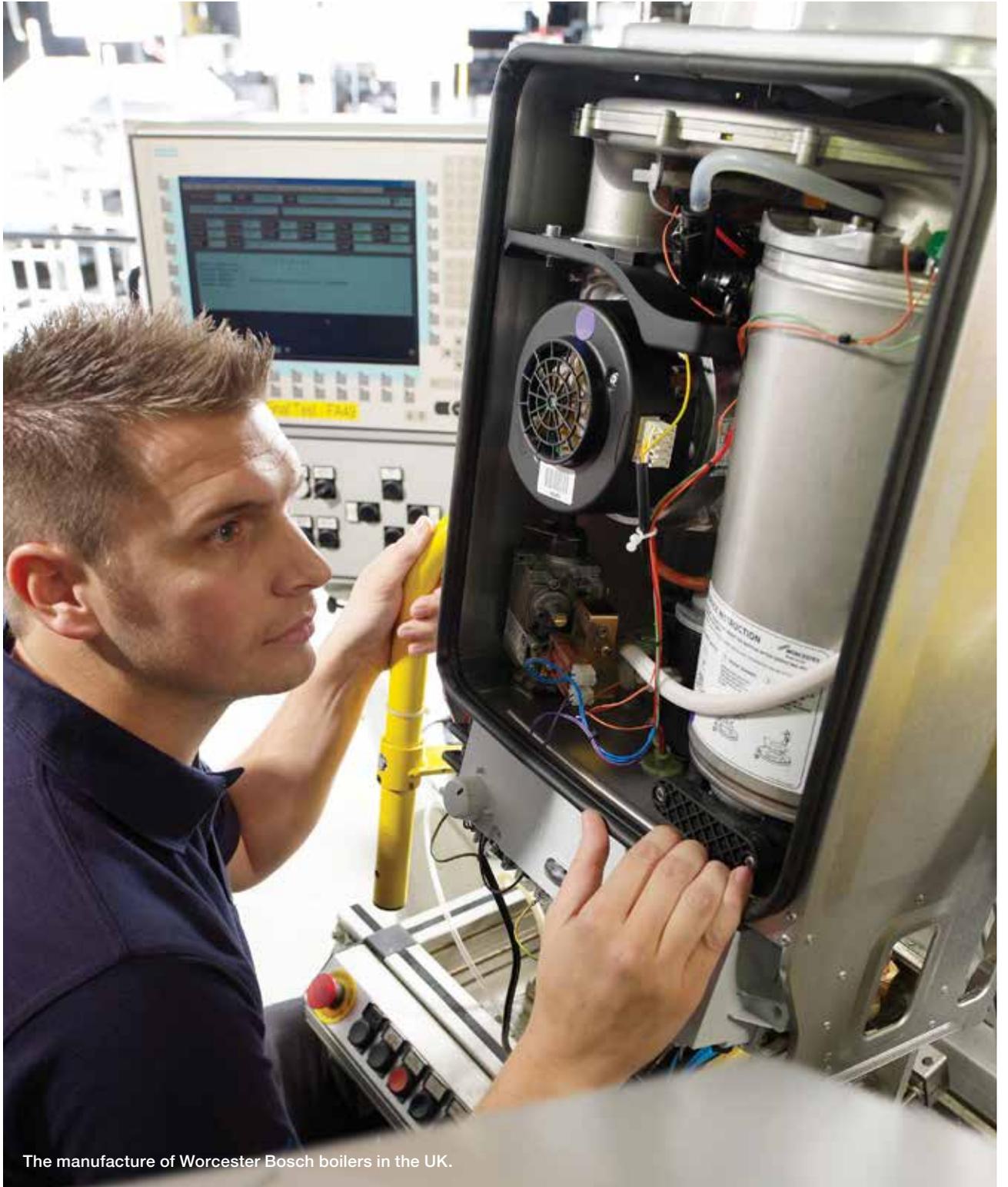
Graph 5: Deployment of total renewable heat supported by the Renewable Heat Incentive under different scenarios.



Within commercial, public and industrial sectors, we estimate that in order to contribute the central range of deployment potential shown above and make vital contributions to renewable energy and carbon targets, the Renewable Heat Incentive would need to result in around £10 billion of investment between now and 2020, supporting up to 20,000 jobs.¹⁹²

The government is investing £650,000 in high-quality renewable heating training for heating engineers so that they can diversify away from only working on gas-based heating systems and ensure a high quality service in the exciting new renewable heat market.¹⁹³

Source: RHI Impact Assessment



The manufacture of Worcester Bosch boilers in the UK.

70%

of UK gas boilers sold were
manufactured in the UK.¹⁹⁴

£5 billion private sector investment to 2020 in Combined Heat and Power systems.¹⁹⁵

Kingston Heights to deliver cheaper energy for residents

Kingston Heights development will be using a new open water heat pump system that uses solar energy stored naturally in the river Thames to power space heating, hot water and cooling for the 137 apartments, hotel and conference centre.

Once fully operational, residents' thermal energy bills are estimated to be 15- 20% cheaper than a gas boiler. The system can deliver 2.3MW of thermal energy, producing zero on-site carbon emissions.¹⁹⁶

Between now and 2020, we also expect investment in renewable and natural gas fuelled Combined Heat and Power systems of around £5 billion in total, promoted by a supportive tax environment.¹⁹⁷

Government is spending £6 million supporting the early stage development of over 50 heat network projects in towns and cities in England and Wales. Each one has the potential to develop into a multi-million pound investment opportunity.¹⁹⁸ In 2012, the government produced a national interactive Heat Map, mapping heat demand across England at individual building level, to help investors identify the best opportunities for such networks. This is being further developed to include new opportunities such as water-sourced heat pumps.

Energy efficiency



Energy efficiency

Investing in energy efficiency and smart technology is a cost-effective way to support growth, cut bills, enhance business productivity, improve living standards and cut carbon emissions.

Government and industry partnerships have grown a multi-billion pound market for energy efficiency in the UK, supporting over 100,000 jobs. Globally, investment in energy efficiency is estimated to more than quadruple to \$530 billion per year in the early 2030s.¹⁹⁹

The government has put energy efficiency at the forefront of energy policy. Our ambition is to see the UK get closer to using only the energy we need. The UK has already cut its level of energy consumption in eight of the last nine years, even in the face of population growth.

Our policies are working:

- The UK's energy intensity is now 20% lower than in 2003.²⁰⁰
- Over the last four years, energy consumption has fallen across all sectors of the UK economy.²⁰¹
- The UK's declining energy consumption reflects our international leadership and the UK now has the least energy intensive economy in the G7.²⁰²

Many of the investments pay back through savings on our energy bills. Our existing demand side policies saved the UK £4 billion on its energy and transport fuel bills in 2013 and are estimated to save £20 billion from these bills in 2020.²⁰³

100,000

The number of **UK jobs** supported by the energy efficiency industry.²⁰⁴

Energy efficiency in the home

With 80% of the energy we consume in our homes being used for heating, there is a great opportunity for homeowners to invest, make savings and take control of their bills with energy efficiency measures.²⁰⁶

Building on our strengths

Over the next few years, households will have unrivalled access to technologies that can help reduce energy consumption, such as smart meters, insulation and cost-cutting heating technologies and increased choice over heating measures through the Renewable Heat Incentive.

- Between January 2013 and April 2014, around 700,000 households had measures installed through the ECO and the Green Deal schemes.²⁰⁷
- Over the next 3 years, another 1.1 million households will benefit²⁰⁸, delivering around £1 billion per year in investment in homes through energy company spending in Great Britain.²⁰⁹

Households are now using around 20% less energy than they were in 2004 – saving the average consumer around £200 a year.²¹⁰ These savings are driven by installations of energy efficiency measures and improvements in appliance energy efficiency. Today, two thirds of households have loft, cavity wall and hot water tank insulation.

Households are now using around **20% less energy** than they were in **2004** – saving the average consumer around **£200** a year.²¹¹



There are **£45-£60 billion** worth of insulation investment opportunities in the UK housing stock.²¹²

Measure	Suitable Homes	Homes with Measure	Remaining Potential
Loft Insulation (at least 125mm)	24 million	16 million	7 million
Cavity Wall Insulation	19 million	14 million	5 million
Solid Wall Insulation	8 million	0.3 million	8 million
Hot Water Tank Insulation	14 million	14 million (99%)	0.1 million
Double Glazing throughout	27 million	20 million	7 million
High efficiency boilers	27 million	12 million	15 million

Table 2: Homes with Measures and Suitable Homes by efficiency measure, 2011/12 .

Source: Green Deal, ECO and insulation statistics: quarterly release to March 2014 for Loft, Cavity Wall and Solid Wall Insulation for Great Britain. Figures are as of March 2014. Hot Water Tank and Double Glazing figures are from tables 3.21 and 3.22 of Energy Consumption in the UK and refer to 2011. The high efficiency boilers figure is from the English Housing Survey and is uplifted to Wales and Scotland. Some homes are heated electronically or from renewable sources and may not need a boiler. Figures may not add due to rounding.

Note: Suitable homes refers to all homes that could have this measure. Of the 5 million homes with potential for Cavity Wall Insulation, 1.4 million are considered to have limited potential and 0.5 million of these are considered hard to treat. Of the other 3.6 million properties without Cavity Wall Insulation, 2.9million are considered hard to treat. Please see the Green Deal, ECO and insulation statistics for more details.

The **Government's** demand side energy policies are estimated to save **£20 billion** for **households** and **business** from their **fuel bills** in **2020**.²¹³

The opportunity on offer

In the UK there is considerable potential for investment in energy efficiency. Approximately £45-60 billion investment is needed by 2030 to insulate all remaining suitable lofts, cavity walls and solid walls in the UK.²¹⁴ There is further opportunity for investment in, high efficiency boilers and smart technologies. The government is committed to supporting households manage the impact of rising energy prices by investing in the UK building stock - 6% of domestic properties are currently rated as being in the lowest building energy efficiency categories.²¹⁵

To help address this:

- Over the next 3 years, £450 million government funding is supporting energy efficiency. This includes the Green Deal Home Improvement Fund, which offers up to £7,600 cashback towards energy efficiency improvements such as insulation, more efficient boilers, and glazing.
- Products standards and labelling policy is driving innovation in the energy efficiency of a range of products from TVs to boilers and is estimated to deliver £4 billion of UK investment to 2030.²¹⁶
- We intend to consult on new regulations to improve the energy efficiency of buildings in the private rented sector, ensuring that tenants are able to benefit from higher standards of living and lower energy bills.

Energy efficiency in business

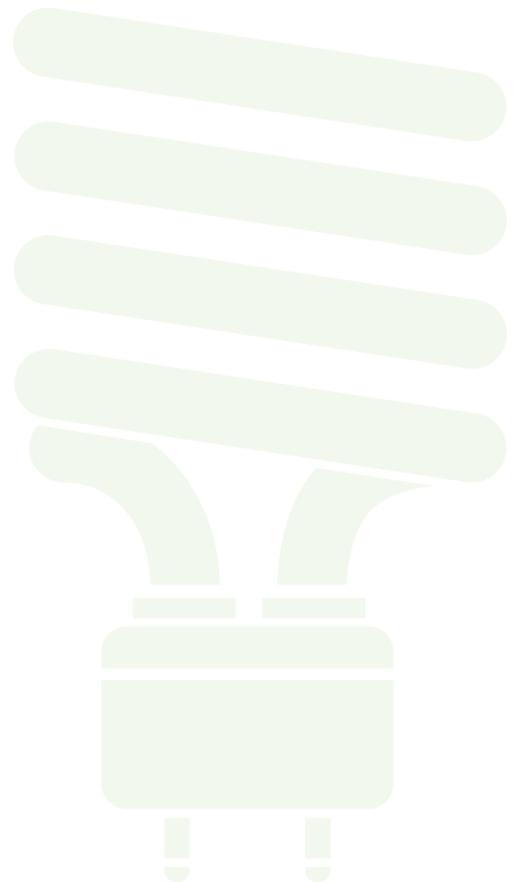
Building on our strengths

We are supporting business and industry through a range of policies focussed on eliminating the barriers to investment in energy efficiency. This has helped businesses cut their costs, get access to the support and information they need and reduce administrative burdens.

- The CRC Energy Efficiency Scheme and the newly announced Energy Savings Opportunity Scheme are projected to drive a combined £1.4bn billion of investment by 2030.²¹⁷
- At the start of the scheme in 2013/2014 9,000 sites have signed up to Climate Change Agreements which commit energy-intensive business to an 11% reduction in energy consumption by 2020 in return for tax relief.²¹⁸
- Over 1,000 UK power sector and heavy industry installations participate in the EU Emissions Trading Scheme (ETS) that gives businesses the flexibility to reduce competitively their carbon emissions. UK sectors covered by the EU ETS are expected to account for 45% of the reduction in the economy-wide emissions cap between 2013 and 2020.²¹⁹

The opportunity on offer

More and more businesses in the UK are recognising the productivity and competitive benefits of energy efficiency investment. As well as being the least energy intensive economy in the G7²²⁰, the UK is the second least energy intensive economy in the EU28²²¹. Major opportunities for investment in energy efficiency are still available and 18% of commercial properties are currently rated as being in the lowest building energy efficiency categories.²²² The Carbon Plan 2011 identified £18 billion of low carbon investment potential to 2027 across businesses and industry outside of the EU ETS.²²³ The UK Green Investment Bank has already set aside £150 million for energy efficiency projects.²²⁴







The **UK** is now the **least energy intensive** economy in the **G7**.²⁰⁵

Potential for **£18 billion** low carbon investment in business and industry to 2027.²²⁷

The UK Green Investment Bank has set aside £150 million for energy efficiency projects.²²⁶

M&S implementing new 'green leases' for stores

M&S have included a new environmental leasehold clause in all new UK relevant leases and existing contracts for 58 of its UK stores, so landlords and tenants can better manage a building's environmental performance and make significant carbon reductions.

Since the start of 2013/14:

- M&S reached an agreement with the Better Buildings Partnership. The project will sign approximately 70 agreements at UK sites.
- M&S is encouraging a joint investment approach in eco-building technology such as biomass boilers, LED lighting and rainwater harvesting to further reduce building impacts and costs.

The move is part of M&S' eco and ethical programme commitment to reduce energy use in M&S stores, offices and warehouses by 35% by 2015. M&S has already achieved a 28% reduction but intends to go further.²²⁸

Sainsbury's making progress on energy efficiency

Sainsbury's operates over 1,100 stores and uses nearly 1% of the UK's energy in total. Sainsbury's have committed, through their 20x20 Sustainability Plan, to reduce absolute operational carbon emissions by 30% by 2020. To date, Sainsbury's have achieved a 9.1% absolute reduction in electricity since 2007/08, at the same time it has grown store space by 25%. This has been achieved by increasing energy efficiency and sourcing more energy from renewable sources.²²⁹

Smart meters, grids and systems

Smart meters are transforming the energy market, putting consumers in control of their energy use, and reducing energy waste.

Over 50 million smart gas and electricity meter installations, 30 million communication hubs and in home displays, attracting £7.5 billion capital investment.²³¹

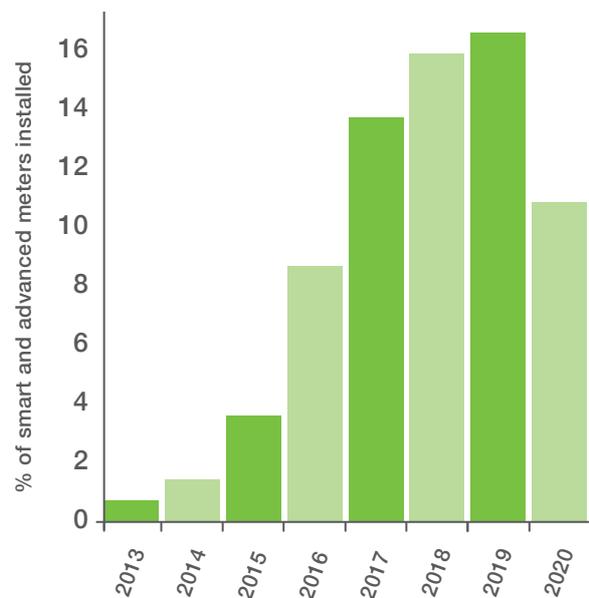
New products and services will be supported, enabling a more competitive market in energy and energy management. Smart metering also lays the ground for the development of smart grids, enabling the efficient management of supply and demand long into the future.

Building on our strengths

Nearly 100,000 smart meters were installed in GB domestic properties in the first quarter of 2014, making a total of just under 400,000. In the non-domestic sector, total GB installations reached over 500,000 smart and advanced meters.

Between 2015 and 2020, 53 million meters will be replaced with smart electricity and gas meters in all domestic properties and smaller non-domestic sites, covering approximately 30 million premises.²³⁰

Graph 6: Smart meter installations per year – proportion of total deployment.



Source: DECC estimates based on Suppliers' updated roll-out plans.

Around **100,000 smart meters** were installed January to March 2014, taking the total number of smart meters in homes around the country to **400,000**.

The opportunity on offer

The national roll out of smart meters requires £7.5 billion of private sector investment, including home equipment and displays, communications infrastructure, and IT, between 2012 and 2020. At its peak, the roll-out will mean at least 10,000 jobs in meter installations and support.²³²

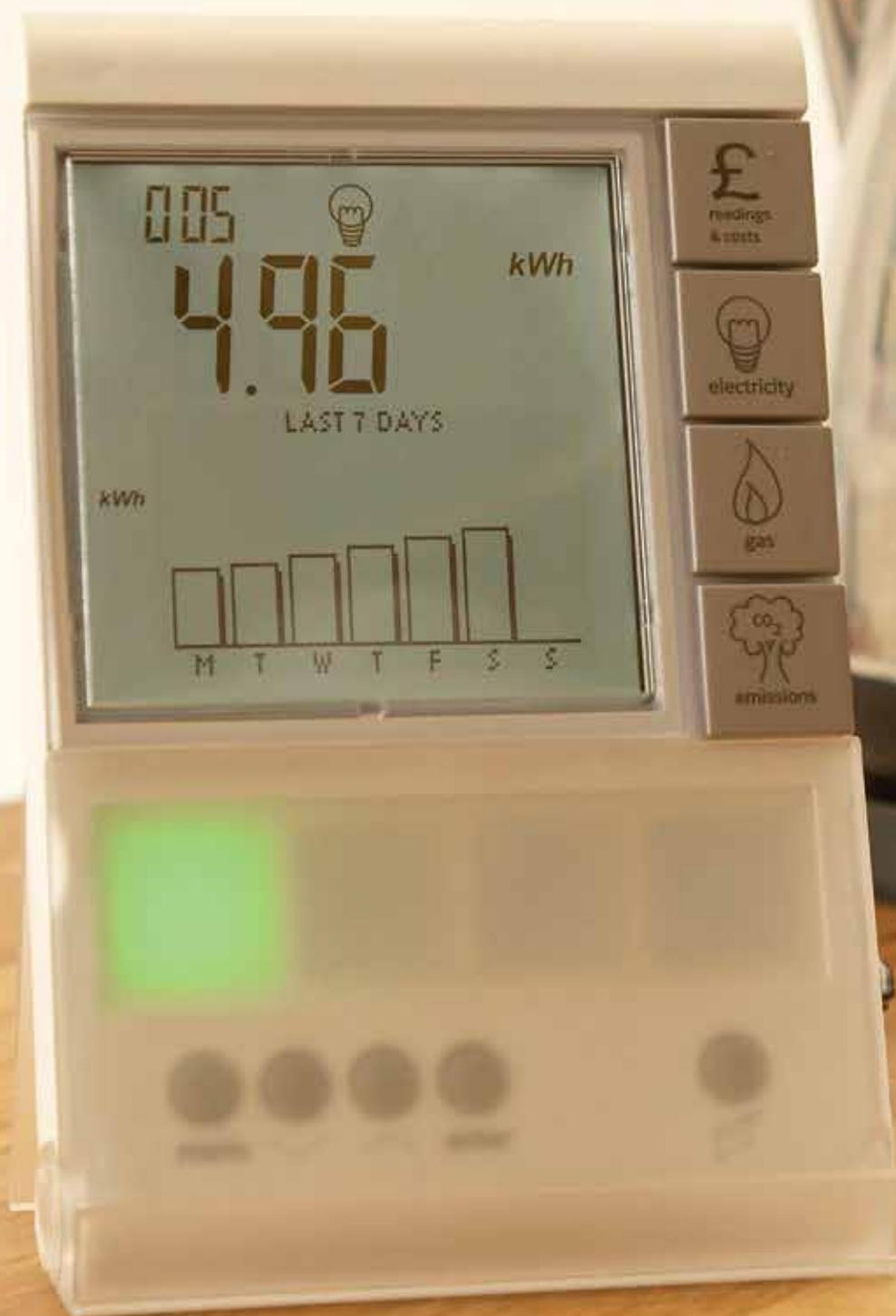
The electrotechnical industry expects further jobs to be created assembling the meters as well as new opportunities in product and technology development. One smart meter manufacturer has already announced 600 UK jobs as a result of a significant procurement of smart meters by a large supplier. The average dual fuel household is expected to make an annual bill saving of around £26 by 2020, scaling up to over £700 million per year across GB households.^{233, 234}

Smart grids and systems

Smart Meters are a key enabler of future Smart Grids. A report commissioned by Smart Grid GB, suggests that the development of smart grids could lead to approximately £13 billion of Gross Value Added between now and 2050 and export earnings of £5 billion to 2050. Making the necessary investments to deploy smart grids could support 8,000 - 9,000 jobs during the 2020s and 2030s.²³⁵

Smart meters will also enable the development of widespread Home and Building Energy Management systems (HEM & BEM). These technologies have the potential to deliver substantial value in UK business creation, with estimated global HEM market revenue of over £1 billion in 2022.²³⁸

At least **10,000 jobs** will be supported by the roll-out of smart meters.²³⁶





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237. Source(s): Cost figures are based on cost and performance assumptions for <4kW solar PV (central scenario) developed for DECC's FITs analysis. Assumptions are based on the following reports prepared for DECC: Element Energy/Poyry: 'Design of Feed-in Tariffs for sub-5MW electricity in Great Britain- quantitative analysis for DECC'; CEPA: 'Updates to the Feed in Tariffs model- documentation of changes for solar PV consultation'; Parsons Brinckerhoff, 'Solar PV Costs Update: January 2012' and 'Solar PV Costs Update: May 2012'. Costs up to April 2012 are for historic installation costs reported in these reports. After this date, projected costs from the later Parsons Brinckerhoff report are used. Installations from monthly feed-in-tariff commissioned installations by month (DECC, published monthly)
238. 'Home Energy Management In-Home Displays, Networked HEM Systems, Standalone HEM Systems, Web Portals, and Paper Bill HEM Reports: Market Analysis and Forecasts'; Navigant Research, <http://www.navigantresearch.com/research/home-energy-management>

