Department of Energy & Climate Change

The Energy Efficiency Strategy:
The Energy Efficiency Opportunity in the UK

November 2012

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The Mission

- Improving our energy efficiency is a key strategic objective for the Coalition Government. It is fundamental to decarbonising the UK, maintaining secure energy supplies, and increasing the productivity of our businesses. We have a proud history of making the very most of our resources and energy should be no different.
- **This Coalition Government has a mission to seize the energy efficiency opportunity, accelerating the deployment of twenty-first century energy saving measures through:**
  - **connecting energy efficiency knowledge and technologies to finance seeking strong returns;**
  - **supporting energy efficiency innovation;**
  - **harnessing the power of improved energy use information, driving its availability and disclosure; and**
  - **encouraging collective action to act on this new and better information.**
- As set out in this strategy the benefits to energy efficiency can be significant, including:
  - boosting growth and creating jobs in our economy;
  - saving households and businesses money on fuel bills;
  - creating a more sustainable and secure energy system;
  - delivering cost effectively against our climate change goals; and
  - reducing energy imports.
- The December 2011 Carbon Plan was clear that, if we are to cut our green house gas emissions by 80% by 2050, 'energy efficiency will have to increase dramatically across all sectors'. It set out four possible scenarios for 2050, relative to 1990, which imply a per capita demand reduction of between 31% and 54% relative to 2007.
- This Government has already made progress through radical initiatives such as the Green Deal, but this Strategy pinpoints the remaining energy efficiency potential within the UK economy and summarises the actions we will now take to realise this.

Contents

The annexes to this strategy can be found at http://www.decc.gov.uk/eedo

Ministerial Foreword

Energy efficiency belongs at the heart of a low-carbon economy. By reducing energy use and cutting down on waste, we can reduce energy bills, make our energy system more sustainable, and drive down greenhouse gas emissions.

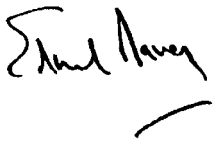
Too often, governments have neglected the role that energy demand reduction can play in managing our energy system. Yet measures that reduce demand can contribute in a more cost-effective way to meeting our energy and climate goals than supply-side measures. That's why energy efficiency – as a way of reducing demand – takes pride of place at the centre of the Coalition Government's policy framework.

I want Britain to get as close as possible to using only the energy we really need. We could be saving 196TWh in 2020, equivalent to 22 power stations through, socially cost-effective investment in energy efficiency. That is around 11% lower than the business as usual baseline. It could also reduce carbon emissions by 41 $MtCO_2e$, contributing to achieving our carbon budgets.

Britain's homes have been built and developed over hundreds of years, and their energy efficiency varies from good to dreadful. Bringing as many homes as possible up to the level of the best is not only a worthwhile investment; it also presents a huge business opportunity, including a chance for British companies to develop expertise which can be exported to overseas markets.

This strategy sets the direction for energy efficiency policy for the coming decades. It makes clear our ambition, the barriers that we need to address, and the additional steps we are taking now to stimulate the energy efficiency market. It shows how we will act to connect finance with demand, encourage innovation, and make energy efficiency information more accessible to the consumer.

Energy efficiency can reduce energy bills for households and businesses, and can boost the economy in a sector with great potential for future growth, driving innovation in the process. The prospect of achieving more with less energy is an exciting one, and this strategy sets out the opportunity in full.



Edward Davey
Secretary of State for Energy and Climate Change

Clarification of scope

The Energy Efficiency Deployment Office (EEDO)

EEDO has developed this Strategy, drawing from expertise across Government and considering energy efficiency potential across the UK economy, including in businesses, buildings, products and transport. It is the first in a series of documents that EEDO will produce.

EEDO has been set up within DECC to support the delivery of our existing energy efficiency policies, by improving our evidence base and analysis, ensuring effective delivery against the observed energy efficiency potential in the economy, and by bringing coherence to the Government's offer to the consumer.

Beyond DECC, EEDO forms an inclusive initiative with UK Government Departments, the Scottish and Welsh Governments represented on its quarterly Steering Board and Northern Ireland having observer status. As the evidence base is developed, the objective will be to share information, by region and sectors where possible, and consider solutions to achieving further energy efficiency potential as a group.

Devolution

Any development of policy in the area of energy efficiency needs to take into account the following arrangements:

- that, in Scotland[1] and Wales, the encouragement of energy efficiency is devolved, while the regulation of energy efficiency is reserved; and
- that the promotion and regulation of energy efficiency is devolved to Northern Ireland.

Furthermore, as policy ideas in this Strategy are developed they will need to take account of where they may impact on other policy areas that are devolved to Scotland and Wales. Northern Ireland are able to draw from EEDO's work as it considers its own future energy efficiency policy.

This approach is reflected in this Strategy, with differences between the policy frameworks of devolved Governments clearly referenced.

1 *Low Carbon Scotland*, the Scottish Government's first report on proposals for meeting the annual climate change targets set under the Climate Change (Scotland) Act 2009. http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp

The Energy Efficiency Opportunity in the UK

1. The UK now has a huge opportunity to optimise the energy use of both domestic and business customers, reducing bills and/or warming homes, while at the same time, delivering a more sustainable society. Individuals can do this through taking action to reduce their demand, such as turning off energy using products that are not in use, buying products that are more efficient or installing energy efficiency measures in their homes. Businesses can take similar actions, reducing their long term operating costs. The critical importance of energy efficiency to our long-term energy policy is reflected in last December's **Carbon Plan**[2].

2. Many of the views received in response to the February 2012 Energy Efficiency Call for Evidence[3,4] recognised huge potential but asked for greater certainty on what was needed to improve our energy efficiency at a national level. This response sets out the long term direction required as well as specific actions that will be taken now.

"This is an Energy Efficiency Strategy to maximise existing policy and realise the wider energy efficiency potential that is available in the UK economy."

3. This strategy identifies four overarching barriers to greater energy efficiency that have to be overcome. Action is already being taken, but if we further pursue these barriers we will be able develop a stronger, self sustaining energy efficiency market and more consumers will be able to see a return, creating positive reinforcement of the potential of energy efficiency. The four corresponding 'barrier annexes' to this strategy[5] outline those policies that are already in place to tackle these issues and provide case studies where public and private sector organisations have already been successful in achieving greater energy efficiency, realising the associated benefits.

4. Our broad assessment of the policy framework is that the energy efficiency agenda for households is well covered by existing initiatives, although there is still a need to maximise the way these policies work. There is, however, particular further interest in significant commercial and industrial energy efficiency potential not already covered by the existing policy.

"We estimate that through socially cost-effective investment in energy efficiency we could be saving 196TWh in 2020, equivalent to 22 power stations[6,7]".

2 Carbon Plan, DECC, December 2011
3 Energy Efficiency Call for Evidence, DECC, 8 February 2012.
4 The Government's Call for Evidence summary of responses can be found at Annex F of this strategy.
5 Annexes A-D.
6 The costs and benefits of measures have been calculated from the societal perspective, in line with the appraisal guidance set out in the Green Book and the supplementary guidance provided by the Inter-departmental Analysts' Group on valuing carbon emissions avoided, energy savings and air quality improvements. This means that the value of energy savings is based on the resource costs, not the retail price (and non-traded carbon emissions and air quality impacts are included). Capital costs are assumed to be paid upfront and financing costs are excluded. The costs and benefits are discounted over time at the social discount rate. A measure that is cost-effective from the societal perspective may not be cost effective for the individual investor. For more detail on the methodology of the EE-MACC, see Annex E.
7 Assumption of a power station with 1 GW capacity operating full-time..

5. The potential for the 2020s is even greater. Considered in this way, energy efficiency can play a major role in the UK's balancing of energy demand and supply.

6. Box 1 provides a summary of additional actions we are taking alongside this strategy in order to help stimulate a self sustaining energy efficiency market. These actions and others across the broad energy efficiency spectrum are covered in more detail within the barrier annexes.

Understanding energy efficiency

"Energy efficiency is a measure of energy used for delivering a given service. Improving energy efficiency means getting more from the energy that we use."

7. There are different ways to improve energy efficiency. For example:

- **'Innovation'** can lead to the equal or greater output with less energy.
- **'Cutting out wasted energy'** reduces energy needed while maintaining output.

Box 1: Further action taken as part of this Energy Efficiency Strategy

- A key focus is **supporting the finance market** through: publishing guidance on financing energy efficiency for the public sector; announcing a research project with ENWORKS to understand the process, costs and benefits of financed energy efficiency projects; initiating an assessment of compatibility of energy efficiency investments with the public sector budgeting framework; taking the RE:FIT programme, which facilitates the public sector use of the ESCO market, nation-wide and the Electricity Demand Reduction project.
- We are going further on **energy efficiency innovation** by: announcing three new 'energy efficiency' Technology Innovation Needs Assessments (TINAs); sponsoring three new energy efficiency Green Business Awards; and, reviewing the way that new innovative energy efficiency measures are reviewed and accredited.
- We are working to **strengthen the evidence base** through: commissioning research into the potential of advanced heating controls; working with the IEA to explore all benefits of energy efficiency; setting out a future DECC Evidence Strategy; and co-ordinating with Research Councils UK and others, to support the development of a knowledge hub for the refurbishment of existing homes as well new Energy Demand Research Centres, announced with this strategy.
- A further focus area is **controls and information**, where we will: launch a behavioural trial with the John Lewis Partnership on whether providing information on lifetime electricity running costs helps consumers; making funding available to increase the proportion of facilities managers receiving specialist energy efficiency training; develop a trial to study the impact of advice on how to use heating controls provided when boiler checks are carried out; and announce a forthcoming DECC Community Energy Strategy as well as commission a Community Energy Efficiency Outreach Programme with Groundwork UK.
- Within **audits and standards**, we will focus on: beginning the process for implementing energy audits for non-SME enterprises, as required by the Energy Efficiency Directive; and seeking the ISO50001 Energy Management Standard accreditation for DECC.

- **'Heating technologies'**, such as heat pumps, can deliver greater output for less supplier energy.

8. Through greater energy efficiency we can use less primary fuel or power to enjoy the same level of output. For example, by improving manufacturing equipment it is possible to produce the same or more with lower overheads. Improved energy efficiency can provide many economic, social and environmental benefits for the UK and yet we are not doing all we can to realise them.

9. Clearly, this is not a new policy agenda. The first energy demand reduction policies were developed by the Department of Energy in 1974 in response to oil shocks and many different approaches have been taken since to improve our energy use efficiency, with some success[8]. Approaches have changed, as have the ways in which we have used energy, but there has never been a quick fix. So why an Energy Efficiency Strategy now?

10. We must continue to find solutions, such as those provided by the Green Deal and Smart Meters, which allow us to tap into the cost effective energy efficiency improvements that are right there in front of us; whether it be through more efficient industrial processes, better use of heat, or simply installing energy efficient lighting.

The energy efficiency opportunity

11. The energy efficiency sector in the UK already accounts for about 136,000 jobs and had sales of £17.6 billion in 2010/11. Sales in this sector have grown by over 4% per year in the UK since 2007/08, and are projected to grow by around 5% per year between 2010/11 and 2014/15. However, there is more potential in the market[9].

12. Stephen Chu, the US Secretary of Energy, has said that "energy efficiency is not just low-hanging fruit; it is fruit that is lying on the ground"[10]. With the right market in the UK we could unlock more of the potential for energy efficiency investment, helping to generate growth and jobs. Alongside the associated carbon reductions, improvements in our energy security by reducing demand for imported

Box 2: Why now?

There are good reasons to set the direction on improving energy efficiency in the UK:

- **finding ways to do more (or the same) with less** makes economic sense;
- **it can help households and businesses reduce their energy bills** at a time of increasing energy prices;
- many **energy efficiency improvement schemes are approaching implementation** and we need to clearly set out the linkages and the collective ambition;
- we need to be clear as to **the role of demand side management** as our electricity generation market is reformed; and
- energy efficiency needs to be taken forward as a cost effective solution to carbon reduction to meet **our carbon budgets**.

8 See Figure 3 for the trend of consumption per capita in the UK.

9 K-Matrix, Low Carbon and Environmental Goods and Services data (2010-11). The energy efficiency sector has been defined as the energy management and building technologies subsectors. http://www.bis.gov.uk/policies/business-sectors/green-economy/market-intelligence/market-data

10 Steven Chu, The Times, London, 26 May 2012..

energy, warmer homes and lower resulting energy bills mean increasing energy efficiency is win-win-win. We must, and will, make it happen in the UK. Greater energy efficiency may also support improvements in wider resource efficiency.

Energy efficiency potential in the UK economy

13. Responses to the Energy Efficiency Call for Evidence highlighted the significant energy efficiency potential in the UK economy and detailed analysis confirms that there is significant cost effective potential. The Energy Efficiency Marginal Abatement Cost Curve (EE-MACC) estimates the energy savings through implementing energy efficiency measures. It is based on detailed modelling of ambitious scenarios for the potential for investment in energy efficiency from different sectors of the economy, based on current evidence. The more cost-effective a measure, the closer it is to the left-hand side of the chart. For more detail on the methodology and assumptions see Annex E.

14. We estimate that through socially cost-effective investment in energy efficiency we could be saving 196TWh in 2020, equivalent to 22 power stations[11,12]. Were all this potential to be realised, final energy consumption in 2020 could be 11% lower than the business as usual baseline. This potential can be found across the UK economy and realising this could have significant benefits for businesses and households. For example, the EE-MACC analysis suggests there is potential for cost effective energy efficiency in commercial buildings and industry over and above that which we expect to be realised through policies such as the EU-ETS, CCAs or CRC (DECC analysis suggests that around 14% of total energy use in the business and public sector are in organisations that are not included in these policies).

15. Further, there is the potential to save energy through changing how we use it, both in domestic and business settings, while maintaining the benefits delivered. This potential is not fully captured within the framework of the EE-MACC. Developing a stronger understanding of the potential for energy efficiency and evaluating the impact of policy on incentives to invest in energy efficiency is a priority for EEDO. As the evidence base improves, the detailed assessment what the potential is for energy efficiency investment may be adjusted.

The benefits of energy efficiency

16. **Economic growth:** Installing energy efficiency measures often requires local labour[13], and the investment has the potential to boost employment and economic growth. The business community see this as important in the current global economic climate[14,15]. There are also long-term growth benefits. For example, lower domestic energy bills can lead to higher disposable incomes that can be spent elsewhere in the economy, while businesses can see a reduction in running costs and so an increase in productivity. Simple changes in energy use

11 The costs and benefits of measures have been calculated from the societal perspective, in line with the appraisal guidance set out in the Green Book and the supplementary guidance provided by the Inter-departmental Analysts' Group on valuing carbon emissions avoided, energy savings and air quality improvements .This means that the value of energy savings is based on the resource costs, not the retail price (and non-traded carbon emissions and air quality impacts are included). The capital costs are assumed to be paid up front and financing costs are not included. The costs and benefits are discounted over time at the social discount rate. A measure that is cost-effective from the societal perspective may not be cost effective for the individual investor (and vice versa).

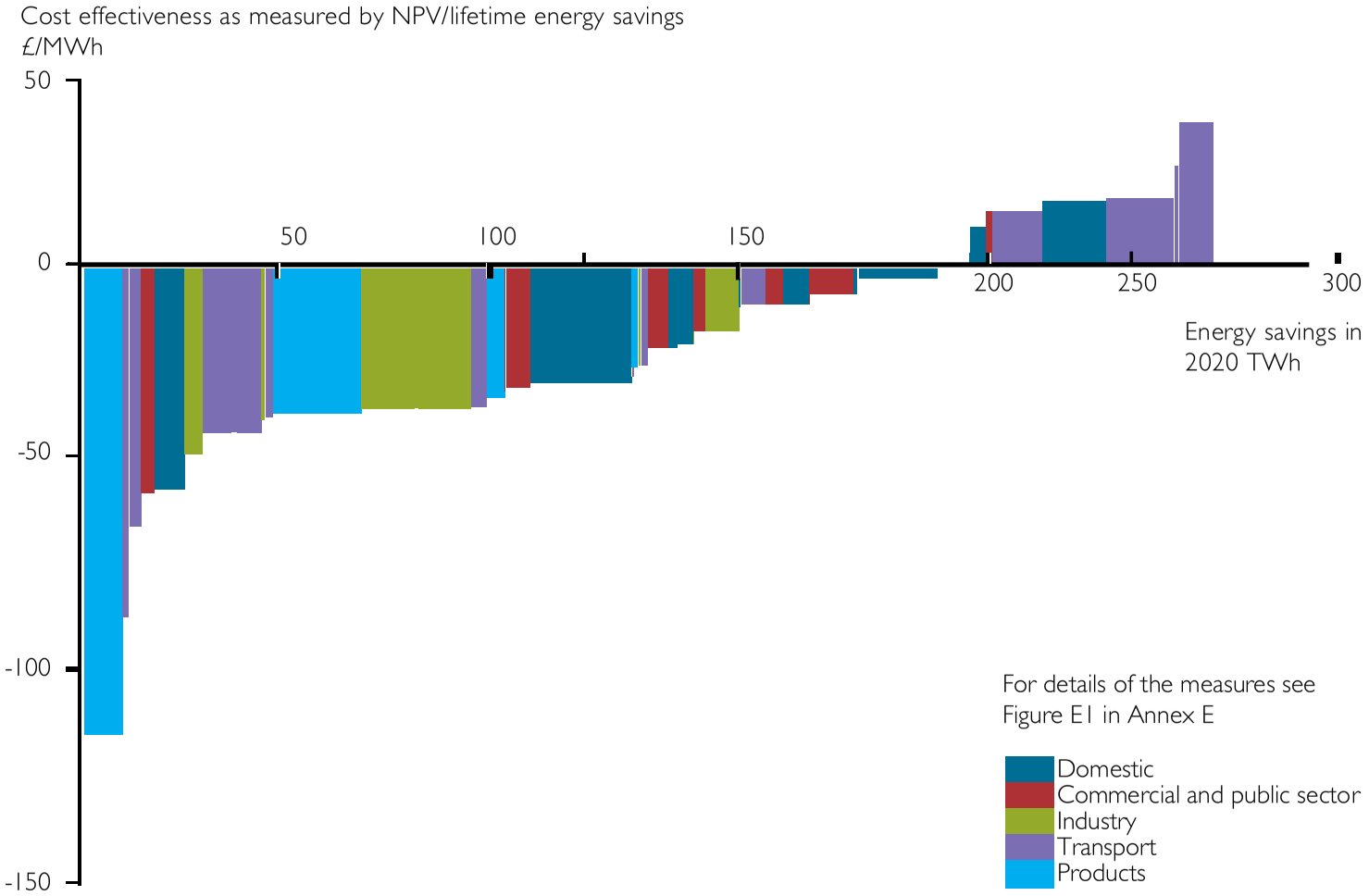
12 Asssumption of a power station with 1 GW capacity operating full-time.

13 Last year Groundwork, a third sector organisation, helped 4,200 people progress into training, education or employment, many of them into 'green jobs' (see Annex D for more detail).

14 Economist Intelligence Unit, Energy Efficiency and energy savings: a view from the buildings sector, October 2012, http://www.globalbuildings.org/resources/uploads/Report_EIU_GBPN.pdf

15 The colour of growth: Maximising the potential of green business, CBI, July 2012.

Figure 1: 2020 Energy Efficiency Marginal Abatement Cost Curve



Notes:

For more detail on the methodology and assumptions see Annex E consistent with the 2012 DECC energy projections and supplementary Green Book Guidance appraisal guidance. The business as usual baseline excludes policies that have been introduced since 2009. The net present values are calculated in 2012 terms.

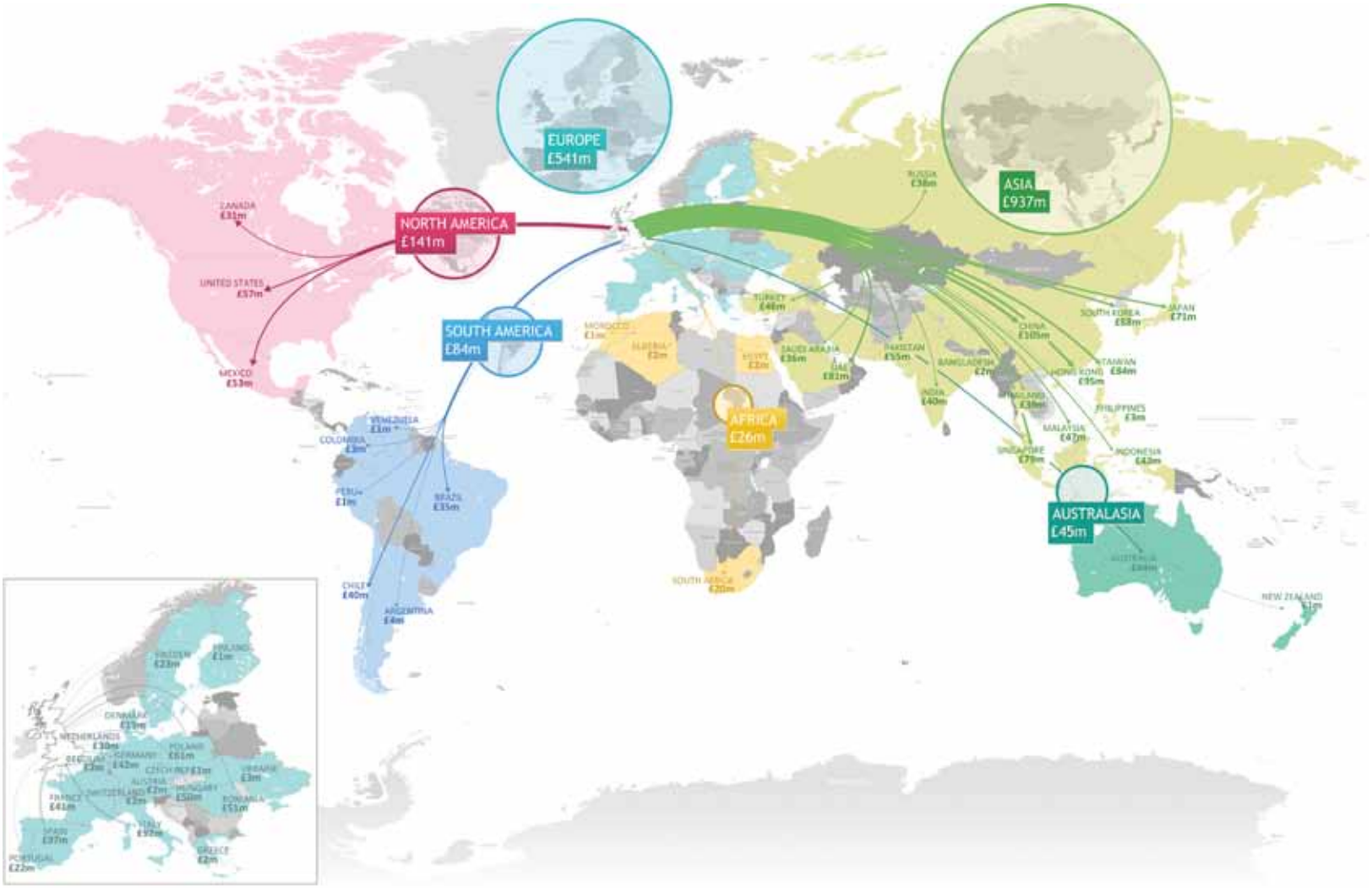
Products policy estimates become increasingly uncertain beyond 2020, where the market may naturally deliver more efficient products – this will be reviewed in future. The energy savings from Tranche 1 and 2 of products policy within the industrial sector have been included in the potential for energy savings in industry.

Smart meters estimates are consistent with cost and savings assumptions as applied in the smart meter impact assessment and costs required for the delivery of the policy are taken into account (i.e. not only the asset costs for the provision of the technology are reflected). To be consistent with the methodology used here, financing costs have been excluded.

The transport analysis is consistent with that included in the Carbon Plan (December 2011). The assumptions, on fuel prices and growth for example, have not been revised since.

Estimates for the energy savings from CERT (20% uplift and extension) and CESP are consistent with the projected net energy savings set out in the DECC energy projections. The estimates of energy savings is net of comfort taking, but we have not valued comfort taking for these measures. The NPV for these policies is estimated based on discounting to 2009.

Figure 2: UK energy efficiency exports in 2010/11[12]



Exports from the UK Energy Efficiency Sector in 2010/11 were worth £1.8 billion

16 K-Matrix, Low Carbon and Environmental Goods and Services data (2010-11). The figure shows the size of UK Energy Efficiency Sector exports in 2010/11 to 50 other countries. These are the countries with the highest sales from their own Low Carbon and Environmental Goods and Services sectors, based on when the data series started in 2007/08.

behaviour can deliver some of these benefits with little up-front cost.

17. Longer term investment in energy efficiency technology can also lead to a virtuous circle as innovation leads to cost reductions which can make it cheaper and easier to invest in energy efficiency in the future. Developing our innovative capacity in technology, materials or business models for energy efficiency opens up the potential for increasingly significant export opportunities for the UK as the global effort to combat climate change ramps up.

18. Thinking more broadly than headline export figures, we can see real examples of UK expertise shaping people's approach to energy efficiency across the globe. For instance:

- Mark Group using the know-how developed over four decades in the UK to establish successful energy saving operations in the USA, Australia and New Zealand.
- CO_2 balance supporting the distribution of energy efficient stoves in Tanzania.
- Arup carrying out energy efficiency audit work on university campuses in the USA.
- The BRE (Building Research Establishment) are working with partners in China and Brazil to develop Green Building Demonstration Parks where UK companies can showcase their world-class building techniques, products and services for homes and communities and help set the standard for sustainable development.

19. Economic studies show that improved energy efficiency can bolster productivity, increasing growth and reducing inflation. A study of the Government's energy efficiency policy between 2000-2007 estimated that these policies increased the annual rate of economic growth by around 0.1 percentage points within that period[17]. The study also estimated that these policies resulted in roughly 270,000 additional jobs in 2010 owing to the cumulative impact of higher growth. Looking forward, DECC analysis suggests that the

Box 3: Energy efficiency and the DECC fuel poverty strategy for England

Tackling fuel poverty is about helping people on low incomes who cannot keep warm at reasonable cost. There is some evidence that certain vulnerable groups, such as households with older people and children, can be the most at risk of health detriments associated with cold homes, such as respiratory illnesses. Energy efficiency has a clear role to play in assisting these households, insulating them from the cold as well as the effects of rising energy prices.

Earlier this year, Professor John Hills published his review of fuel poverty. In it he proposed a new framework for measuring fuel poverty, which the Government has announced it intends to adopt subject to the outcome of an ongoing consultation. The Government also announced it would publish a new fuel poverty strategy in 2013.

Under the proposed new measurement approach, a household is fuel poor if it is low income and has high energy costs relative to all other households. A key factor driving energy costs is, of course, energy efficiency. As such, the Government's new strategy will set out how energy efficiency improvements can be made in such households, to provide a sustainable means of reducing costs.

17 Barker, T., Ekins, P., & Foxon, T. (2007). The macro-economic rebound effect and the UK economy. Energy Policy, 4935-4946..

Green Deal and ECO alone could support up to 60,000 jobs across the UK in 2015[18].

20. **Savings for domestic and business consumers:** As highlighted as part of the recent 'Big Energy Saving Week', improving the UK's energy efficiency is central to delivering a fair deal for the consumer. UK households are already benefitting from improvements in energy efficiency such as heating efficiency and insulation. Building Research Establishment modelling suggests that, if no energy efficiency gains had been made since 1970, current energy use would be almost double their current levels, adding about £1,000 to the average annual energy bill[19]. Energy efficiency will continue to have a role in driving long term reductions in household energy bills.

21. Wellbeing can also be enhanced through increased energy efficiency. For example, a higher disposable income, as a result of lower energy bills, can allow increased spending on other necessities. In addition, the health benefits from properly installed energy efficiency measures can be significant. It is possible to quantify health benefits in quality of life terms, in line with the principles of the Department of Health/NICE guidance. DECC modelling of the impact of the installation of solid wall insulation in all properties in England, gives a total improvement in the health of those individuals in the properties of £3.5bn – £5.0bn over the lifetime of the measures. If all cavity walls reported unfilled in 2009 were also filled this would provide a further monetised health benefit of £4bn – £6bn over lifetime of the insulation[20].

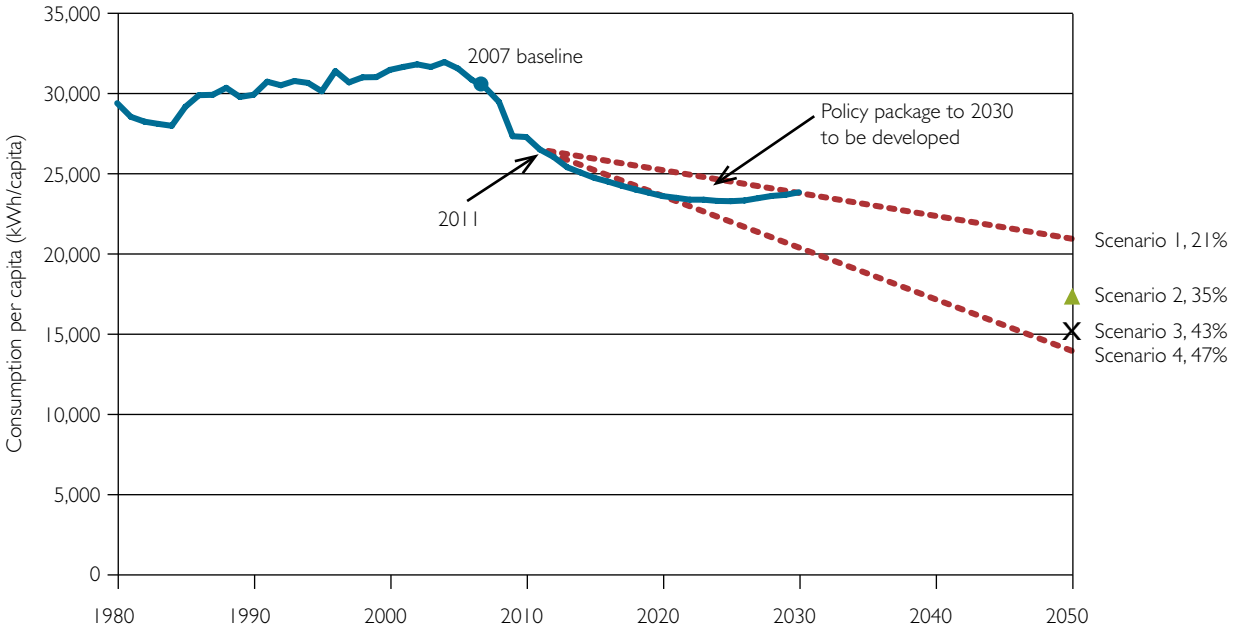
22. Some of the financial savings from energy efficiency measures may be spent on energy consuming goods and services: the rebound effect. This means that the overall impact on energy consumption is smaller, although consumers may feel a benefit from the additional energy consumption. The nature of rebound effect will vary depending on the energy efficiency measures adopted. For example if someone increases the level of insulation in their property, the direct rebound effect would be an increase in the temperature to which the house is heated and an indirect rebound effect would be using the savings on heating bills to buy an additional television. It is possible that the direct rebound effect might be reduced through providing advice when energy efficiency measures are installed.

23. Energy efficiency is also one of the central pillars of the Government's efforts to tackle fuel poverty. Improving the energy efficiency of the home is often the most cost-effective way of making a sustained reduction in household heating costs and removing that household from fuel poverty. Professor John Hills' Review of Fuel Poverty in England[21] included a consideration of the role of energy efficiency in helping vulnerable groups (see box 3).

24. **Emission reductions:** To deliver against our greenhouse gas emission targets over the coming decades in the most cost effective way, we need energy efficiency to improve significantly across all sectors. The 2011 Carbon Plan[22] sets out scenarios through which the UK could meet its legally binding target to reduce greenhouse gas emissions by 80% between 1990 and 2050. The Carbon Plan 2050 scenarios require energy efficiency to contribute a reduction in final energy consumption per capita between 2007 and 2050 of 31-54%. Figure 3 shows that, after moving to a 2011 baseline, these Carbon Plan Scenarios now require per capita savings of between 21% and

18 Final Impact Assessment for the Green Deal, DECC, June 2012
19 Energy savings from Energy Consumption in the UK table 3.18 and current energy prices.
20 Preliminary modelling that assumes the insulation measures are valued over their lifetimes and are appropriately installed in line with regulations and industry guidance.
21 Scotland, Wales and Northern Ireland have a separate fuel poverty strategy and fuel poverty programmes.
22 Carbon Plan, DECC, December 2011.

Figure 3: UK final energy consumption per capita compared against carbon plan scenarios: 1980-2050[23]



47% between 2011 and 2050. The current policy package is on track to be comfortably within this range through to 2020 but additional action is needed to maintain progress after 2020[24] and energy efficiency tends to be a cost-effective option.

Box 4: DECC 2050 Scenarios

In the 2011 Carbon Plan, DECC set out four scenarios to achieve reductions in greenhouse gases of 80 per cent between 1990 and 2050. These scenarios were set against a 2007 baseline.

- Scenario 1: Low energy efficiency and high nuclear generation (31% energy per capita saving from 2007 baseline).
- Scenario 2: High Carbon Capture & Storage (CCS) and additional Bio-energy (43% energy per capita saving from 2007 baseline).
- Scenario 3:CORE MARKAL scenario (50% energy per capita saving from 2007 baseline).
- Scenario 4: High energy efficiency and higher renewables (54% energy per capita saving from 2007 baseline).

***Note: Figures 3 and 4 these scenarios have been extrapolated to a 2011 baseline.**

23 Energy Efficiency Statistical Summary http://www.decc.gov.uk/eedo

24 *Low Carbon Scotland* (http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp), the Scottish Government's first report on proposals for meeting the annual climate change targets set under the Climate Change (Scotland) Act 2009 details areas of joint working such as the establishment of the Green Deal and ECO and also highlights Scottish initiatives such as its approach to retrofitting insulation in existing homes and Scotland's targets for renewable heat and electricity.

Figure 4: UK final energy consumption compared against carbon plan scenarios: 1980-2050

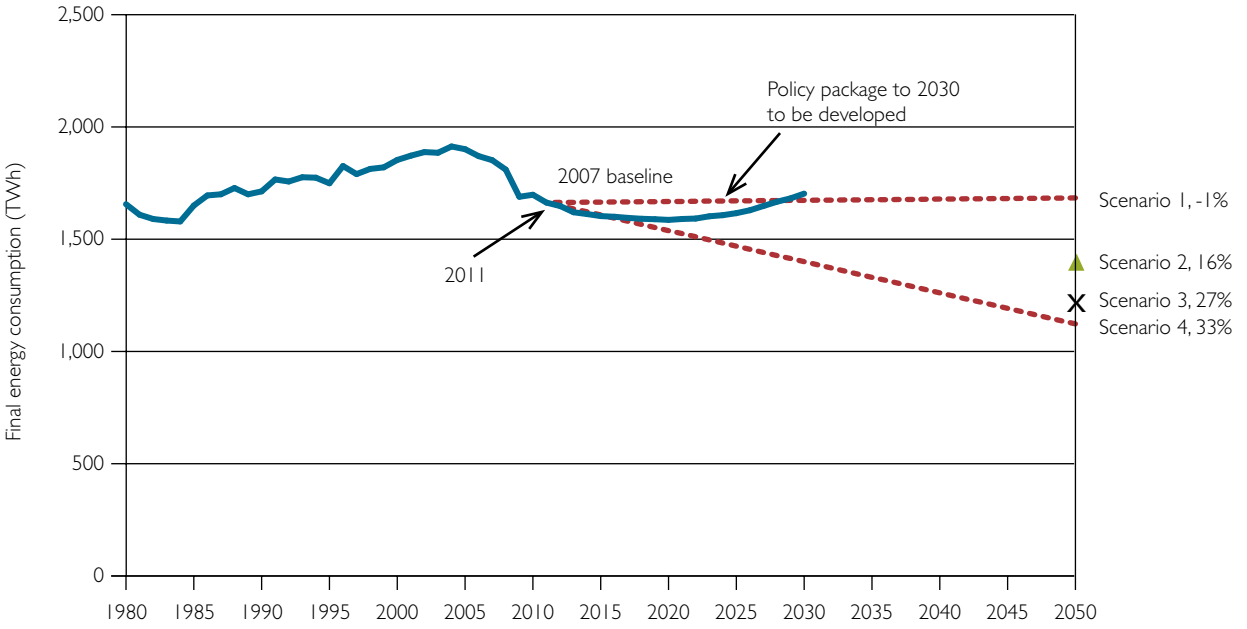
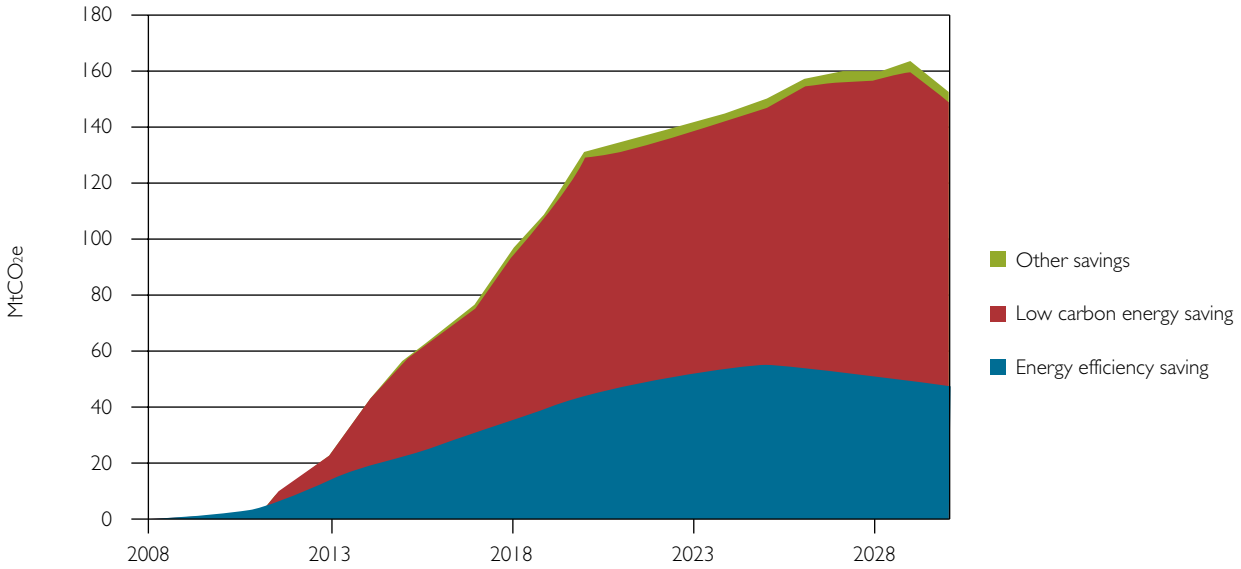


Figure 5: Projected savings of Green House Gas (GHG) emissions by type: 2010-2030[25,26,27]



25 Greenhouse gases include Carbon dioxide, Methane, Nitrous Oxide, Hydrofluorocarbons, Perfluorocarbons and Sulphur hexafluoride. These are presented as CO_2 equivalent based on their Global Warming Potentials. Non-CO_2 emissions arise from non-energy related activity for example methane from agriculture and fluorinated gases from industrial processes. Low carbon energy savings' includes generation and transport. 'Other savings' are the non-CO_2 savings from agriculture and waste. (Energy Efficiency Statistical Summary http://www.decc.gov.uk/eedo)

26 Energy efficiency policies have been defined as those aimed to reduce final energy consumption (for example product standards or installing insulation) Low carbon energy savings include switching to low carbon energy sources (e.g. renewable electricity, transport bio-fuels etc) and transformation sector energy savings. Other savings include savings of non-CO_2 greenhouse gases.

27 DECC, Updated Energy and Emissions Projections, October 2012.

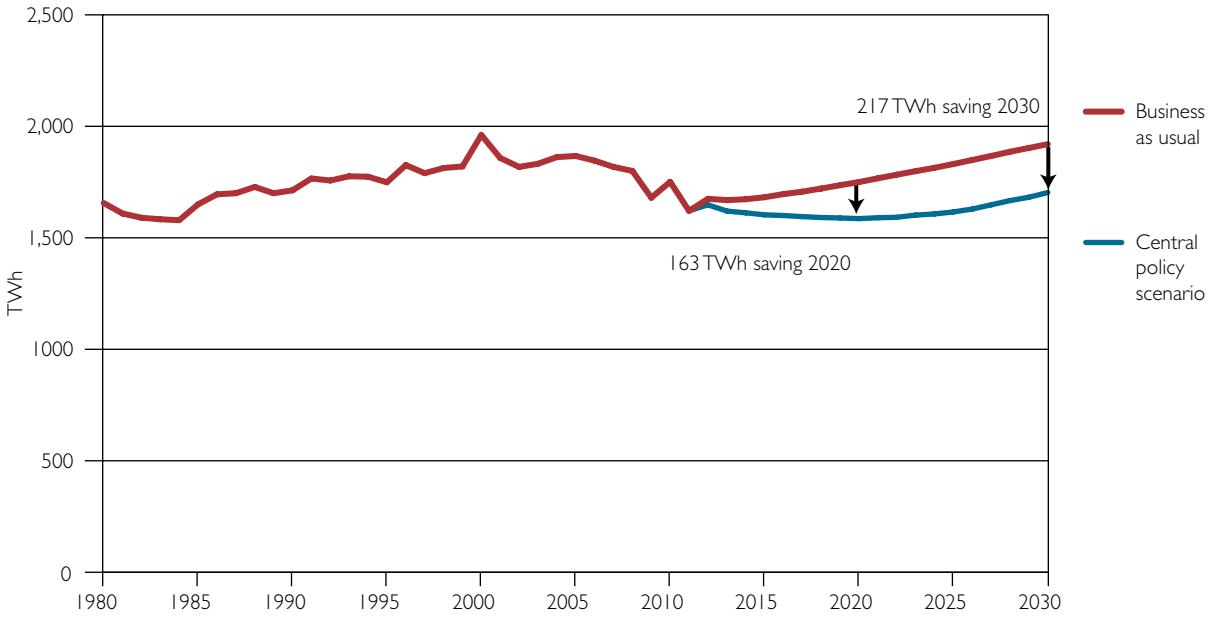
Box 5: Central Government Departments – 2010/11 10% carbon emissions reduction target

In May 2010 the Prime Minister announced that central Government would reduce its carbon emissions by 10% within 12 months. This target spanned 3,000 central government office buildings and was met by a combination of managing buildings more efficiently, rationalising the estate, investment in energy efficient technologies and green information technology and changes to staff behaviour.

Within the year, a 13.8% reduction was achieved, equivalent to 104, 532 tonnes of carbon dioxide or nearly 238 million kWh of energy – an estimated saving of £13 million on energy bills. The Prime Minister has subsequently announced a new five year commitment; this time to reduce Government greenhouse gas emissions by 25% for 2014/15 compared to a 2009/10 baseline across a broader scope of the central government estate and from business-related transport.

25. In terms of energy consumption, the Carbon Plan scenarios translate to a range from a 1% in absolute final energy consumption from 2011 to a 33% decrease. Again, Figure 4 shows that the UK is well on course to achieve this trajectory in the short term but without further policy action energy consumption will rise again in the 2020s[28]. As well as taking action now, we need to set the direction for this in subsequent decades as it will take time for the energy efficiency market to mature. This strategy is the first step.

Figure 6: Projected UK final energy consumption 2000-2030[29]



28 The DECC energy and emissions projections only take account of policies for which funding has been agreed and that are sufficiently well developed to allow robust estimates of future savings to be provided. Therefore the projections for the 4th carbon budget (2023 – 2027) onwards represent a baseline scenario in which the government takes no further action to reduce energy demand or increase take up of renewables outside the power sector. Therefore the projections for 2030 do not do not represent the government's view of what we expect to happen. The government does plan to take further action to reduce energy demand and remains fully committed to meeting its carbon targets.

29 Energy Efficiency Statistical Summary http://www.decc.gov.uk/eedo

26. The existing policy package is due to deliver savings in greenhouse gas emissions of 134 $MtCO_2e$ (24%) in 2020 and 161 $MtCO_2e$ (28%) in 2030, relative to business as usual. In 2020 33% of these savings are due to improved energy efficiency with the remaining coming from switching to low carbon energy sources for example nuclear power and road transport biofuels. The impact of current policies that reduce energy demand are assumed to taper off in impact after 2022, (the fourth carbon budget period) and by 2030 the share of energy efficiency policy impact falls to 31%. In the non-traded emissions sector[30], energy efficiency policies make up 59% of the savings in 2020 and 75% of the savings in 2030.

27. **A sustainable and secure energy system:** Through reducing energy consumption we improve the UK's energy security[31]. A more energy efficient UK will have lower exposure to international energy market price rises and volatility. There can also be specific benefits to the energy system of decreasing demand as it reduces the long-term need for investment in additional infrastructure that would have otherwise been required. This has the potential to reduce the overall cost of our energy generation framework in the future.

Box 6: Implementing the 2012 EU Energy Efficiency Directive

In June this year, and with active support from the UK, Member States agreed the new Energy Efficiency Directive. This is due to be published shortly and will need to be fully implemented by Spring 2014. The Directive is a significant step forward by the EU as it looks to meet its target to reduce primary energy consumption by 20% by 2020 against business as usual projections. The Directive includes obligations on Member States to:

- set themselves **indicative targets for primary energy consumption in 2020**, taking into account the EU's overarching 2020 target;
- meet annual targets for **building renovation**, or equivalent energy savings, on the central government estate;
- **meet binding energy saving targets** through the deployment of a supplier obligation and/or equivalent policy measure/s;
- require non-SME enterprises to undergo **energy audits every four years**;
- ensure developers of new generation installations over 20MW undertake a cost-benefit analysis of the case for developing a **Combined Heat and Power** (CHP)Plant; and
- report regularly to the European Commission through a series of periodic **National Energy Efficiency Action Plans**.

EEDO will lead on the implementation of this Directive, working with other Departments and Devolved Governments to deliver its requirements cost effectively. For example, we will consult on the implementation of the requirement for large commercial building energy audits during the first half of 2013.

30 Emissions that are not covered by the EU Emissions Trading System.
31 See forthcoming Energy Security Strategy, DECC.

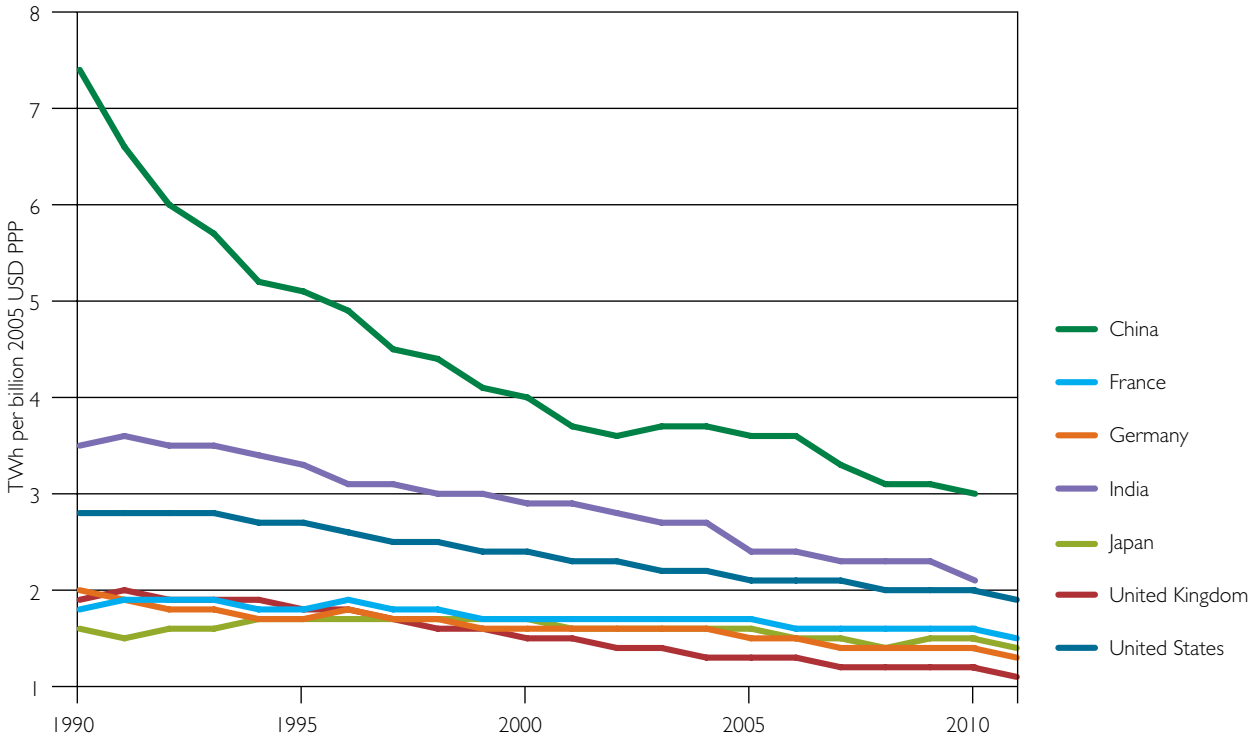
Our ambition for improving energy efficiency

28. **The UK:** Success for EEDO will be delivering energy demand reduction beyond that which current energy efficiency policies are projected to deliver, maximising the performance of the existing framework and going further. The above comparison against what is required to meet our carbon budgets is one indicator of how important achieving this will be, particularly from 2020 onwards.

29. Current projections show that, with no additional energy efficiency policies from 2009, final energy consumption had been projected to rise from the 2010 level by 168 TWh over the next 20 years[32]. However, the existing policy package is due to deliver savings of 163 TWh (9%) in 2020 and 217 TWh (11%) in 2030 relative to the business as usual projection. This means by 2020 current energy efficiency policy should save the UK the amount of energy equivalent to that currently used by about nine million homes in a year or the output from 19 power stations[33]. A full analysis of energy efficiency indicators is shown in section 2 of the Statistical Summary[34].

30. **European Union:** The EU has a target to save 20% of its primary energy consumption by 2020, against the EU's 2007 business as usual projection through improvements in energy efficiency. But the Commission estimated in 2011 that existing policies in member states meant that the EU was only on track to get half way towards that target. Under the Danish Presidency, the Commission therefore developed an Energy Efficiency Plan, published on 8 March 2011, with the aim of closing this

Figure 7: Primary energy consumption per unit of GDP (PPP adjusted)



Source: IEA

32 DECC Energy & Emissions Projections, October 2012, http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx#2012
33 Assumption of a power station with 1 GW capacity operating full-time.
34 Energy Efficiency Statistical Summary http://www.decc.gov.uk/eedo

gap. The Plan contained a range of proposals for action across all sectors of the economy to which the EU Energy Efficiency Directive is intended to give legislative effect. It will also replace and repeal two existing Directives: the Co-generation Directive (2004/8/EC) and the Energy End Use Efficiency and Energy Services Directive (2006/32/EC).

31. **International:** Although there is significant further potential, the UK has already made reductions in energy intensity and is now one of the least energy intensive economies in the developed world. Over the last 10 years UK energy intensity has fallen by 27%, compared to 16% in Japan and United States, 20% in Germany and 14% in France. July 2012 analysis by the American Council for an Energy Efficiency Economy (ACEEE) shows that, of the 12 largest world economies, the UK is performing best overall on energy efficiency indicators[35].

32. This is in part due to the current structure of our economy, with strong services and financial sectors, although we also have a manufacturing sector that is roughly comparable as a proportion of GDP to countries such as France and the US. Nevertheless, there is still significant un-tapped potential for further energy savings when compared to some others, particularly around domestic energy use and in some industrial sectors and we want the UK to take the lead.

33. The advantages of energy efficiency have been well documented[36] but, to increase our understanding further, **EEDO will collaborate with international partners to support the International Energy Agency (IEA) project on further exploring the wider benefits of energy efficiency**.

The barriers to deploying energy efficiency

34. While the evidence suggests that there is significant potential for cost-effective investment in energy efficiency, this potential is not being realised in full. The existence of market failures and other barriers to energy efficiency means that we see less investment in energy efficiency than is best for the UK. To meet this ambition, we need to address the barriers to energy efficiency.

35. While it is possible to characterise these market failures and barriers in a number of different ways, in this Strategy we have categorised them as issues relating to an embryonic market, information (its provision and lack of trust), misaligned financial incentives, and behaviour barriers that mean energy efficiency is undervalued. While we have separated out these groups of barriers, they are often inter-related and work together to reduce investment in energy efficiency. Solving one area of market failure would not be enough on its own to realise the full potential for energy efficiency. At the same time, although there may be overlap, if you were to remove one of these barriers from the list, there would be a notable gap in the analysis.

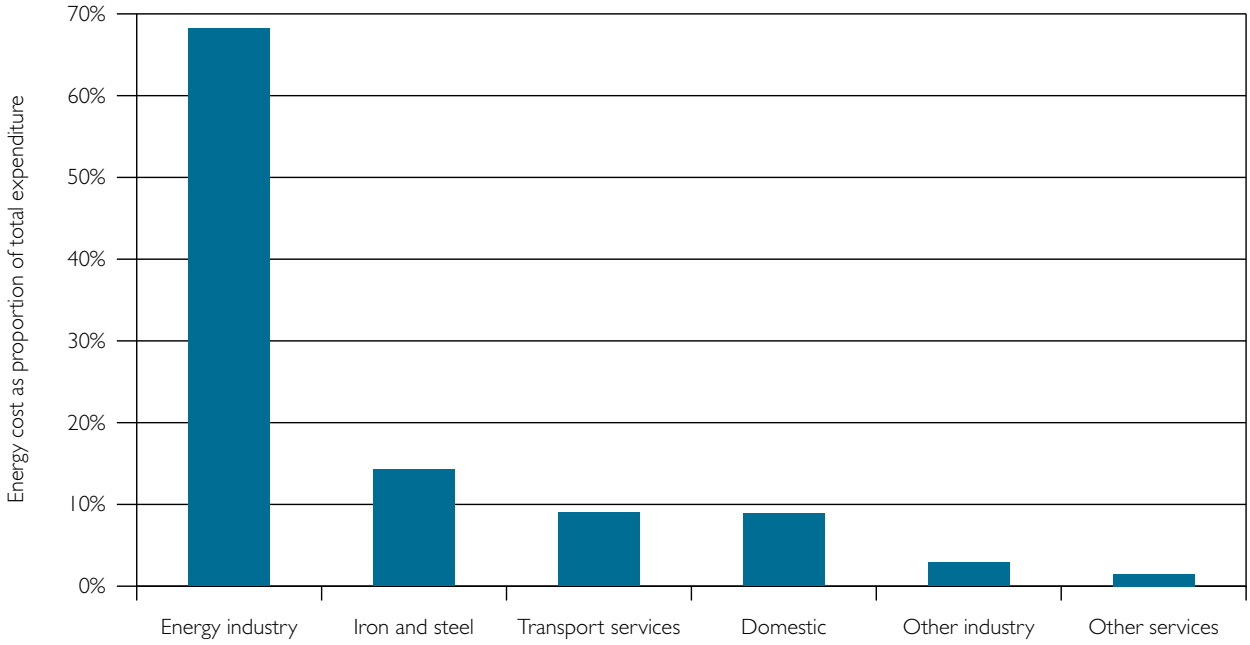
36. Each of the four barriers described below is considered in dedicated annexes to this strategy, showing progress that has already been made by existing policy and identifying further ways in which we can address the energy efficiency potential in the UK economy. Policies often tackle more than one barrier and where they do this is reflected. Where barriers or policies take a different form in different sectors, this is also described.

- **Embryonic markets**: We do not need to create an energy efficiency market, but we want to see it grow and become 'mainstream'

35 The ACEEE 2012 International Energy Efficiency Scorecard, http://www.aceee.org/sites/default/files/publications/researchreports/e12a.pdf

36 The colour of growth: Maximising the potential of green business, CBI, July 2012.

Figure 8: Estimated energy cost as proportion of total expenditure, by UK sector, 2009 (Experimental analysis)[37]



activity, particularly use of different forms of financing. While there are examples of companies focused on helping domestic and non-domestic consumers improve energy efficiency, the market remains underdeveloped, especially in comparison with the United States. Energy efficiency product and services companies could have much greater penetration into the wider commercial, industrial and public sectors, given the benefits they offer. In the absence of a developed market there is relatively little expertise on either the demand or supply side for energy efficiency investment. This constrains the development of financial products to support energy efficiency investment and leads to high transaction costs. Without a catalyst to drive development of the market, the costs around investing in energy efficiency will remain high, reducing cost-effectiveness.

- **Information:** One of the key characteristics of the embryonic market is that there is a lack of access to trusted and appropriate information. Energy efficiency improvements are often made through purchasing upgraded equipment of which energy efficiency may only be one characteristic. Where information is available, it may be generic, and not tailored to specific circumstances, which means that potential investors are not in a position to assess the benefits of an energy

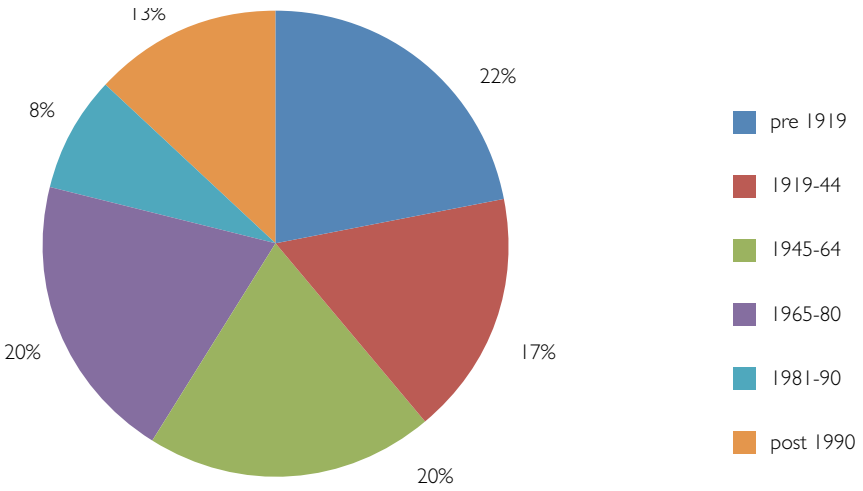
37 DECC analysis of Office for National Statistics data. Data for the non-domestic sector sourced from secondary analysis of the 2009 Supply Use Tables produced by the Office for National Statistics (ONS) as part of the National Accounts. Data for the domestic sector is sourced from the 2009 Living Costs and Food Survey. Private transportation is included in the domestic sector. The transport services sector is defined as organisations which identify their primary business activity as transportation.
This is experimental analysis and as such each sector has an associated margin of error. Total expenditure for the non-domestic sector is defined as final consumption expenditure plus the compensation of employees and non deductable VAT. Gross capital formation has been excluded from this definition of expenditure. Total expenditure in the domestic sector includes VAT.

efficiency investment. Financing of energy efficiency projects can be undermined by the absence of standardised monitoring and verification processes which means that the benefits of energy efficiency investments are not trusted. While information is available about overall energy consumption both in the home and in business settings, it can be difficult to relate that back to individual activities to identify opportunities to make energy efficiency improvements. In the absence of clear, trusted information, many individuals do not prioritise energy efficiency investments.

- **Misaligned financial incentives:** It is not always the case that the person who is responsible for making energy efficiency improvements will receive the benefits of there actions. For example, in most cases commercial rented tenants are responsible for their own bills and therefore it is in their interest to reduce the bills, but contractual arrangements around landlord/tenants or facilities management may inhibit investment. Landlords are unlikely to invest unless they will realise the benefits in monetary terms. On a societal level, wider benefits such as security of supply or emission reductions are not directly felt by those making energy efficiency investments and, as a result, the decision to invest is based only on the benefits directly received. Therefore, energy efficiency investments are not prioritised as they might otherwise be. Figure 8 shows that, across the entire economy, energy costs can be a relatively small proportion of costs for many sectors, but in aggregate that energy use is a huge ask of our energy system.

- **Undervaluing energy efficiency:** The lack of salience of energy efficiency increases the impact of hassle costs and behavioural barriers. Energy efficiency changes may involve significant hassle costs for those carrying out the investment, which increases the costs of the investment. For example, disruption caused by building works or disruption to production lines. Energy efficiency improvements may not be seen as strategic for a company and therefore not prioritised. For example, outside of the energy intensive industry sectors, energy bills are only a small proportion of business costs. If the relative gain is small, then the hassle costs can act as a significant barrier, especially if there is uncertainty around the benefits of the investment. While hassle costs are not a

Figure 9: Age profile of homes in England: 2010[38]



38 DCLG English Housing Survey.
http://www.communities.gov.uk/housing/housingresearch/housingsurveys/englishhousingsurvey/

market failure, they compound the impact of other behavioural barriers, reducing investment in energy efficiency. This is often why companies are reluctant to invest in energy efficiency, seeking short payback times, even if a project is cost-effective at usual interest rates. Wider economic uncertainty is also reducing willingness to invest.

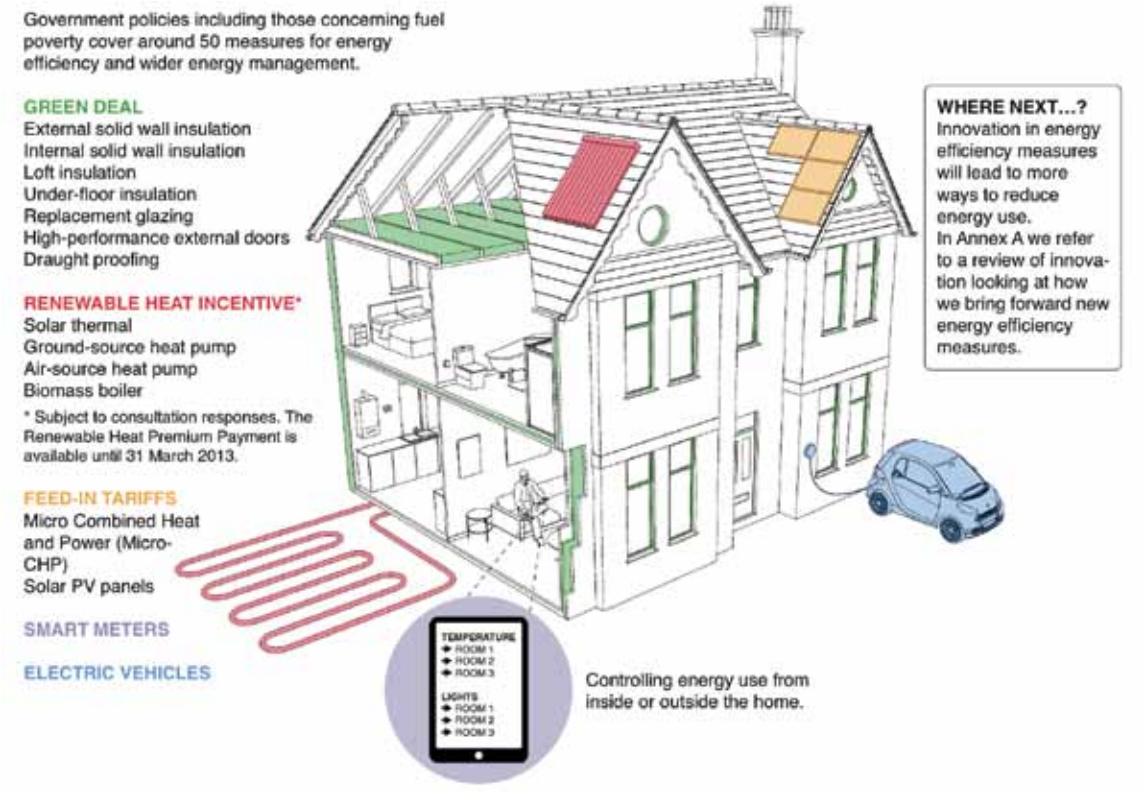
Maximising the potential of existing schemes

37. Many existing schemes address the above barriers and our strategy is to maximise their potential impact. This decade will see a revolution in buildings energy management. Never before have household and business consumers been supported by such a range of Government measures in order to achieve the highest standards of improved energy use. **We will have the Green Deal, Renewable Heat Incentive (RHI), Feed in Tariffs (FiTs) and Smart Meters all available at the same time.** This an era of new opportunities for consumers but also the supply chain and we have discussed with many businesses their plans for the future.

38. Although at least 14 million homes in Britain are not properly insulated, out of a total of 27 million[39]. Our housing and building stock is incredibly varied and high proportion is very old. As of 2010, 39% of homes in England were built before the end of World War II. New buildings are built to higher standards than ever before but it is possible for older housing to catch up through retrofitting and microgeneration approaches.

39. It used to be that images of buildings where people need much less energy and managed every aspect of energy use were set in the future, or seen in a very high end retrofit examples on TV. But the changes we

Figure 10: 19th century house... 21st century energy management



39 Analysis from DECC Insulation Statistics (July 2012) http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/en_effic_stats/home_ins_est/home_ins_est.aspx

are bringing forward will make this the norm and make it affordable to millions.

40. Figure 10 shows the extensive range of measures that will be supported by the emerging suite of schemes. Of course, different people will want to make changes at different times and some will want to do as much as they can together. Both are possible.

41. To realise the potential of the schemes to change the energy management of buildings requires a number of elements to be right for each scheme individually. A key challenge and current priority of the Energy Efficiency Deployment Office is understanding how the schemes interact, can work together and how we might build on them for the future.

42. We are currently focused on the year ahead and mapping the '**customer journey**', exploring the further linkages between existing policies, and working with the supply chain to unlock the opportunities around a joined up offer for the consumer. For example, could packages be developed that take advantage of the Green Deal, FiTs and/or RHI. We need to understand how different types of consumers first become aware of the options that are available to them and the steps that they need to take. Initial market signals suggest that some in the market will deliver packaged options, but it will be necessary to ensure that the whole policy landscape does work together.

43. To further facilitate this **all related future policies will give particular consideration to energy efficiency conditionality**. For example, as part of the September 2012 RHI consultation on expanding the scheme[40], we are consulting on minimum energy efficiency requirements for district heating, commercial space, industrial space and water heating as well as for householders.

44. The National Planning Policy Framework[41,42] we published earlier in the year sets out how planning should support the transition to a low carbon future. The Framework looks to local councils to, for example, plan new development in locations and ways which reduce greenhouse gas emissions and, when determining planning applications, expect new development to take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption. We have also made it clear that local councils in their planning should actively support energy efficiency improvements to existing buildings.

45. To deliver even more savings from these and other policies in the coming years EEDO will continue working across Government and with the Devolved Administrations to explore ways in which policy improvements can divine greater energy efficiency. This will include rationalisation and ensuring greater mutual reinforcement of policies in the medium- to long-term. It will also mean ensuring that these demand reduction policies are aligned.

An energy efficient future

46. We all have a stake in ensuring that we maintain security of energy supply and avoiding dangerous climate change. It is important that we all consider what opportunities we might take to work towards these national and, particularly in the context of climate change, international goals. Energy efficiency provides such an opportunity and, at the same time, an opportunity to save money and improve productivity. As the Carbon Plan makes clear,

40 Renewable Heat Incentive Consultation Documents, Department of Energy & Climate Change, September 2012: http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx

41 National Planning Policy Framework, Department for Communities and Local Government, March 2012: http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf

42 Scotland has its own planning framework: http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/npf/NPF3

our broader strategy is to focus on energy efficiency now, recognising that early demand savings are a no regrets, cost effective way of reducing the effort we will later have to make in decarbonising the energy system.

47. Through to 2030 there will be significant changes to the way we use energy. For example, the way we heat our homes and the way we power our transport as we transition away from fossil fuels. Processes will be more energy efficient, but energy use is still set to rise. We need to exploit existing opportunities to bear down on that potential energy use.

48. There are good examples of progress in the last decade. For instance, by 2020, products policy being implemented in the UK is projected to save 11% of electricity demand. There has been the impact of advances in information technology, including basic heating controls that have now become digital and can now be controlled via smartphone. We need to make best use of these advancements if we are to further increase the country's energy efficiency. It is these things that can help us build the homes of the future, such as that in Figure 10.

49. This Strategy has identified the significant energy efficiency potential and the multiple benefits that could arise from achieving that potential. We need to invest now if we are to overcome the barriers to achieving an energy efficiency market that is mainstream and we have already described actions that we are taking now (see box 1 and Annexes A-D of this strategy).

50. **Looking ahead to the coming year, EEDO's work will include:**

- leading the **implementation of the EU Energy Efficiency Directive**, including consulting on the introduction of **energy audits** for large commercial enterprises in the first half of next year;
- working with the other Government Departments and the Devolved Administrations to further develop the **evidence base** against the gaps identified as part of the analytical work that supported this strategy;
- developing a series of **sector by sector guides** on what benefits increasing energy efficiency can bring to consumers by next summer;
- ensuring policies combined to deliver a well integrated **'customer journey'** in the energy efficiency market;
- considering further options for **maximising the impact of existing policies** and **addressing the additional energy efficiency potential** that has been identified;
- continuing to accept views and ideas through the **eedostrategy@decc** email address[43]; and
- **reporting alongside next year's Annual Energy Statement** on progress against this Energy Efficiency Strategy.

51. Improving the way we use energy is essential to our future economy and future way of life. We have the opportunity to lead the world in becoming more energy efficient and we must take it.

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