Department
of Energy &
Climate Change

UK National Energy Efficiency Action Plan

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Introduction

The UK welcomes the Energy Efficiency Directive (the "Directive"). Energy efficiency belongs at the heart of our long term energy and climate change plan for low carbon growth. The implementation of the Directive will refocus EU efforts on energy efficiency, establishing a common framework and driving the necessary action to help the EU achieve its 20% energy saving target for 2020.

By reducing our energy use and cutting down on waste, we can reduce energy bills for hard-pressed consumers; make our energy supplies more secure and reduce our reliance on overseas imports; and drive down greenhouse gas emissions cost-effectively.

Investment in energy efficiency will also increase productivity and support long-term growth in the UK. In 2011/2012, the UK's energy efficiency market accounted for around 136,000 jobs and sales of over £18 billion.[1] As the UK Prime Minister has highlighted, we are in a global race and it is the greenest and most energy efficient economies in Europe that will prosper.

The UK Government has introduced a wide range of policies to help households, businesses and the public sector reduce their energy use. These policies are working. Energy consumption in the UK has fallen for eight of the last nine years and final energy consumption[2] is now 13% lower than in 2003. Moreover, energy consumption is now falling in all sectors of the UK economy.[3] The UK's declining energy consumption reflects our international leadership on energy efficiency; the UK now has the least energy intensive economy in the G8.

By 2020 final energy consumption in the UK will be 20% lower than 2007 levels, under current projections.[4] But there remains more to do. In 2013, the UK Government launched its *Energy Efficiency Strategy*, which identified the barriers to energy efficiency take up and the socially cost-effective energy efficiency potential that remains in the UK economy.

We are committed to realising this potential and the UK's National Energy Efficiency Action Plan sets out how the implementation of the Energy Efficiency Directive will help. For example, we are introducing the Energy Savings Opportunity Scheme (ESOS) to comply with Article 8 of the Directive. This scheme will provide large enterprises with cost-effective recommendations for energy efficiency improvements every four years. We estimate that ESOS alone will result in

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1 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224068/bis-13-p143-low-carbon-and-environmental-goods-and-services-report-2011-12.pdf

2 On a temperature corrected basis

3 https://www.gov.uk/government/publications/digest-of-united-kingdom-energy-statistics-dukes-2013-printed-version-excluding-cover-pages

4 See Part 1 of the NEEAP for details of the UK's Article 3 target

overall net benefits to the UK economy of £1.9 billion between 2015 and 2030, and drive around 3TWh of energy savings annually. In addition to this, the UK is leading the way on the roll out of smart meters. This programme sits at the heart of our efforts to empower consumers by providing them with access to the information they need to make informed decisions about their energy consumption.

The UK has put in place a broad range of energy efficiency policies as part of our first ever overarching national energy efficiency strategy[5] launched by Prime Minister Cameron in 2013. Through the introduction of the Green Deal and the Energy Company Obligation we are helping households insulate their homes and ensuring that they have access to trusted information about energy efficiency. The UK Green Investment Bank – which was set up in November 2012 with £3.8 billion to invest before March 2016 – is driving innovation and infrastructure investment, and connecting demand for energy efficiency with finance. Later in 2014, the Government will pilot its Electricity Demand Reduction scheme, as part of our Electricity Market Reforms, which will further stimulate innovation and drive permanent reductions in electricity demand.

The Government's ambition is for the UK to use only the energy it really needs. The UK's National Energy Efficiency Action Plan details the progress that the UK has already made on energy efficiency, and the further action we are now taking to realise this ambition.

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65602/6927-energy-efficiency-strategy--the-energy-efficiency.pdf

Part 1: Overview of national energy targets and achieved savings

2020 Energy Efficiency Target

In 2007 the European Union set an ambitious primary energy saving target of 20% by 2020, against a 2007 business-as-usual projection. This forms part of a wider package of targets – known as the "20-20-20 targets" – which make up the EU's 2020 climate and energy package, which includes binding greenhouse gas emissions and renewable energy targets.

The EU Energy Efficiency Directive[1] (the 'Directive') (2012/27/EU) represents a major step forward for energy efficiency in the EU, establishing a common framework of measures to promote energy efficiency across different sectors of the economy throughout the EU. The Directive will play a key role in driving progress towards the EU's 2020 energy efficiency target. Central to achieving this goal is the requirement in Article 3 for Member States to set national non-binding energy saving targets.

The UK's Target

The UK notified the European Commission on 30 April 2013 of its target under Article 3 of the Directive. The UK's target was set at the level of 129.2 million tonnes of oil equivalent (mtoe) for final energy consumption on a net calorific value basis. This represents an 18% reduction in final energy consumption,[2] relative to the 2007 business-as-usual projection, and reflects the UK's ambitious energy efficiency policy package.[3]

Estimates of energy consumption in 2020 can be broken down by sector based on the 2013 Energy and Emissions Projections (see table 1).[4]

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1 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:315:0001:0056:EN:PDF

2 Equivalent to a 20% reduction in primary energy consumption.

3 The UK's target was taken from the UK Department of Energy and Climate Change's Updated Energy and Emissions Projections (published in October 2012).

4 https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2013

Table 1. Estimates of key national energy production and consumption figures in 2020

Estimate of energy consumption in 2020	Million tonnes of oil equivalent (NCV basis)[5]
Total primary energy consumption in 2020	**175.0**
Electricity transformation input (public thermal power plants)	51.0
Electricity generation output (public thermal power plants)	21.6
CHP transformation input	3.5
CHP transformation output – thermal	1.8
CHP transformation output – electrical	1.7
Energy distribution losses (all fuels)	3.3
Total final energy consumption	**126.6**
Final energy consumption – Industry	22.9
Final energy consumption – Transport	50.1
Final energy consumption – Households	38.2
Final energy consumption – Services	14.3
Final energy consumption – Agriculture	0.9

Table 1 shows that the UK is projected to consume 126.6 million tonnes of oil equivalent (mtoe) in 2020, 2% lower than the target set. The projected primary energy consumption of 175.0 mtoe is also lower than the estimate made when the final consumption target was set.

See Annex D for an assessment of the UK's performance against the energy saving target set under Article 4 of the 2006 Energy Services Directive.

[5] The units are reported on a net Calorific Value basis to be consistent with the UK target.

Part 2: Policy measures implementing the Energy Efficiency Directive

1. Horizontal Measures

The UK recognises the huge opportunity that greater energy efficiency presents. It is vital for both domestic and business customers to optimise their energy use, allowing them to reduce their bills and deliver a more sustainable society. The UK has a well-developed policy landscape which tackles the barriers to energy efficiency take up. These policies have helped ensure that energy consumption has now fallen for eight of the last nine years.

The UK welcomes the focus provided by the Energy Efficiency Directive. As stated in our national Energy Efficiency Strategy,[1] we are committed to maximising the performance of our existing policies and going further.

1.1 Energy Efficiency Obligation Schemes and alternative policy measures

Central to the Energy Efficiency Directive is the requirement in Article 7 to achieve a binding final energy consumption target. This target is equivalent to achieving new energy savings each year from 1 January 2014 to 31 December 2020 of 1.5% of annual energy sales[2] to final customers. The energy savings are to be met through the deployment of supplier obligations and/or alternative measures.

In addition to the latest supplier obligation, the Energy Company Obligation (ECO), a number of *alternative measures* will help us achieve the required energy savings for this target. Foremost amongst these measures are the UK's stringent Building Regulations. These regulations, first introduced in the 1980s, will be progressively tightened as we move towards the introduction of the Zero Carbon Homes Standard in 2016.

Setting the target

The target requires new final energy savings each year of 1.5% relative to the average final energy consumption between 2010 and 2012. Making use of the flexibility permitted in Article 7, the UK's target has been set at **324 TWh**. This calculation is described in the UK's December 2013 Notification.[3]

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1 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65602/6927-energy-efficiency-strategy--the-energy-efficiency.pdf

2 Relative to annual energy sales over the period 2010-2012

3 It should be noted that savings and policies presented are taken from analysis done for the December notification. Some of the analysis in other parts of this NEEAP has been updated. Revisions to savings for the purpose of Article 7 will be made in the June update. http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_uk_eed_article7_en.pdf

Policy package to achieve the required savings

The UK is pursuing the alternative measures approach to meet the Article 7 target, in accordance with Article 7(9).

A total of 19 policy measures have been identified to contribute towards the target including three Energy Efficiency Obligations: the Carbon Emissions Reduction Target (CERT); Community Energy Saving Programme (CESP); and Energy Company Obligation (ECO). In total, quantifiable savings equivalent to **467 TWh** have been identified against the target of 324TWh. The total energy savings which will be achieved by supplier obligations is 167 TWh.

Table 2 shows the projected energy savings by policy to be observed in each year covered by the target. All the savings presented are considered additional to how the UK has implemented minimum requirements of previous EU Directives.

A full description and methodology for all policies can be found at Annex B of the UK's Article 7 notification, provided to the Commission in December 2013.

Table 2: Final energy consumption savings by year from UK policies included for Article 7 policy plan, TWh

TWh	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	TOTAL
DOMESTIC															
Carbon Emissions Reduction Target (1020-2012)*	2.7	5.7	9.1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.9	8.8	8.6	116
Community Energy Savings Programme (2010-2012)*	0.0	0.1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	5
Energy Company Obligation*				0.7	1.4	2.1	2.8	3.6	4.4	5.1	5.7	6.4	7.1	7.1	46
Green Deal – domestic					0.2	0.4	0.5	0.7	0.8	0.9	1.1				5
Building Regulations – domestic					4.7	9.4	14.1	18.9	23.6	28.3	32.9				132
Home Energy Efficient Programmes (Scotland)					0.2	0.5	0.7	0.9	1.0	1.0	1.0				5
Private and Social Sector Regulation (Scotland)					0.0	0.1	0.1	0.2	0.3	0.4	0.4				2
Sustainable Energy Programme (Northern Ireland)					0.1	0.1	0.2	0.2	0.2	0.2	0.2				1
NON-DOMESTIC BUILDINGS & INDUSTRY															
Green Deal – non-domestic					0.2	0.3	0.4	0.5	0.6	0.7	0.7				3
Building Regulations – non-domestic					2.4	4.8	7.1	9.4	11.6	13.7	15.8				65
Smart metering – non-domestic					0.3	0.9	1.7	2.6	3.6	4.5	4.4				18
CRC Energy Efficiency Scheme					1.3	2.1	2.9	3.7	4.6	5.5	6.4				26
Energy Savings Opportunity Scheme					0.0	0.0	3.3	3.3	3.3	3.3	3.3				16
Climate Change Levy					1.6	1.3	1.1	1.0	0.9	0.8	0.7				7
Climate Change Agreements					1.0	0.9	0.7	0.6	0.5	0.5	0.4				5
Salix public sector finance					0.0	0.2	0.5	0.8	1.1	1.4	1.6				6
Re-Fit					0.0	0.0	0.1	0.1	0.1	0.1	0.1				1
TRANSPORT															
Rail electrification					0.0	0.0	0.0	0.0	1.1	1.1	1.1				4
Low Emission Vehicle policies					0.1	0.1	0.3	0.4	0.6	0.9	1.2				4
TOTAL	**3**	**6**	**10**	**10**	**23**	**33**	**46**	**56**	**68**	**78**	**87**	**16**	**16**	**16**	**467**

Policies marked are Supplier Obligations and are counted for the period 2010-2023 where applicable

1.2 Energy audits and management systems

Box 1: Existing energy efficiency schemes requiring energy measurement and/or energy auditing

CRC Energy Efficiency Scheme (CRC) – This is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large, but non-energy intensive, public and private sector energy users. It includes around 2000 participants in the public and private sector (which we assess to include between 4,400 and 6,400 subsidiary organisations that would fall within scope of ESOS). Its aim is to encourage organisations to prioritise investment in energy efficiency and cut carbon emissions -- through a tailored combination of drivers, including a carbon price, mandatory standardised monitoring and reporting of energy consumption (which raises awareness of energy use at the Board level of participating enterprises), and the publication of enterprises' aggregated emissions data.[4]

Mandatory greenhouse gas (GHG) reporting – From October 2013, all quoted companies will be required to report on their greenhouse gas emissions or explain why such a report is not necessary. This includes energy use emissions. The UK is the first country to make it compulsory for quoted companies to comment on emissions for their entire organisation in their annual reports. The introduction of these reports is intended to help investors see which companies are effectively managing the potential hidden long-term costs of greenhouse gas emissions.

Climate Change Agreements (CCAs) – CCAs provide energy-intensive industries with tax discounts (worth £170 million a year)[5] in return for meeting energy efficiency targets. As such, measurement of energy use is one of the requirements of the scheme. Targets are set using evidence submitted by industry on abatement potential. CCAs cover around 9,000 facilities (often within the companies targeted by CRC and EU ETS, with the CRC targeting the non-CCA and non-EU ETS energy use).[6]

The Green Deal provides easily accessible, targeted information about potential energy efficiency to households through a two-stage independent assessment. The first stage is based on the existing Energy Performance Certificate (EPC), which is mandatory on sale of a property. The second stage involves production of a more tailored report, based on actual occupancy information to identify the most cost effective measures. The Green Deal can support households to install energy efficiency measures, including: insulation (loft, cavity or solid wall); draught-proofing; improved heating controls; double glazing; and renewable energy technologies (e.g. solar panels).[7]

Energy Performance Certificates (EPCs) – EPCs were introduced as part of the EU Energy Performance of Buildings Directive and present energy efficiency ratings of domestic and non-domestic buildings on a scale from A/A+ to G, based on an assessment of the age, size and fabric of the building. The EPC also contains recommendations on a range of measures to improve building energy efficiency. EPCs must be made available whenever a property is constructed, rented out or sold.[8]

4 https://www.gov.uk/crc-energy-efficiency-scheme

5 http://www.hmrc.gov.uk/statistics/expenditures/table1-5.pdf

6 https://www.gov.uk/climate-change-agreements

7 https://www.gov.uk/green-deal-energy-saving-measures/how-the-green-deal-works

8 https://www.gov.uk/buy-sell-your-home/energy-performance-certificates

Display Energy Certificates (DECs) – From 1 October 2008, buildings occupied by a public authority have been required to have a DEC where the building has over 1000m^2 of usable floor space and is frequently visited by the public. Since January 2013, the threshold has been 500m^2; this will reduce to 250m^2 on 9 July 2015. DECs provide information on actual energy use, not just the theoretical energy rating of a building. Using an A-G rating, DECs take into account the location and size of a building and the way the building is used. The DEC is accompanied by a recommendation report that contains a range of possible improvements, including cost effective measures to improve the energy performance of the building.[9]

Households and SMEs

The UK already has a number of schemes which promote high quality energy audits to end users and fulfil the requirements of Article 8(1)-(3) in terms of encouraging household and SME energy audits. The UK will be introducing new legislation which will encourage SMEs to undergo energy audits.[10]

The **Green Deal** is intended to encourage households to undertake energy assessments. It offers energy efficiency assessments, financing and the installation of energy efficiency measures through a network of Green Deal approved assessors, installers and providers. 188,234 Green Deal Assessments were lodged by the end of March 2014 (since January 2013). Approximately 693,000 measures were installed in around 580,000 properties through ECO, Cashback and Green Deal to the end of February 2014 (the latest month that we have complete data for). The Green Deal is currently a GB-wide policy; however Northern Ireland continues to develop a range of domestic energy efficiency programmes to promote energy efficiency in the domestic sector.

In addition to the Green Deal, energy assessments and energy efficiency recommendations are available in the UK through the Carbon Trust. The **Carbon Trust**, originally set up and funded by the UK Government from 2001 to 2012 (and now a self-financing private company), promotes its Carbon Trust Standard to businesses. Obtaining the standard requires the measurement, reduction and management of emissions/energy use. Similarly, the Energy Saving Trust, which receives the majority of its funding from Government, provides advice on energy efficiency to businesses and households (through the Energy Savings Advice Service helpline), and also provides free resources to energy efficiency professionals throughout the UK.

Northern Ireland

Invest NI offers free energy and resource efficiency audits for businesses and provides technical support to help businesses progress suitable projects to the point of implementation. These programs support in the region of 45-50 businesses per year. Energy issues are addressed primarily through site visits, audits and provision of advice. The Department of Social Development (DSD) also facilitates an energy efficiency advice line and information service that provides advice on grants available, how to access cash backs and any other offers consumers may be entitled to. It also provides factsheets and tips on saving energy in the home through its website.[11]

[9] https://www.gov.uk/energy-performance-certificate-commercial-property/display-energy-certificates

[10] As required by Article 8(2)

[11] www.brysonenergy.org

Scotland

Improving the energy efficiency of SMEs is a priority for the Scottish Government. The new **Resource Efficient Scotland** programme, launched on 1 April 2013, offers comprehensive information, advice and support to business and public sector organisations to implement efficiency measures that will translate into cost savings and increased competitiveness. The programme aims to support at least 12,000 SMEs per year. This support includes site visits and audits, with a principal focus on the implementation of efficiency measures.

As outlined in the **Scottish Government Economic Strategy**,[12] the Scottish Government established the Scottish Energy and Resource Efficiency Service (SERES). This is a virtual partnership that brings together existing business support and advice programmes delivered by a range of bodies, thereby making it easier for businesses to access energy and resource efficiency advice.

Wales

Wales funds the **Carbon Trust** to provide information, advice and support for SMEs to take action on energy efficiency, including providing interest free loans. Support for resource efficiency, including energy efficiency, is also integrated into the Welsh Government's "**Business Wales**" service, which offers audits from resource efficiency officers based in its regional hubs.

The Energy Savings Opportunity Scheme

The UK already has a number of schemes in place that encourage both SMEs and large enterprises to improve their energy efficiency; these schemes are detailed in Box 1. Building on this strong framework, the UK Government is introducing a new Energy Savings Opportunity Scheme (ESOS) which will place a new legal requirement on large enterprises to conduct energy audits which meet the requirements of Article 8(4) and Annex VI of the Directive. We are on target to have the legislative framework in place for this scheme by 5 June 2014. This scheme will be mandatory for all large UK undertakings (of which we estimate there to be around 7,300 in the UK), and we look forward to providing more detailed updates on uptake of audits in future NEEAPs.[13]

Audits carried out

We do not have complete data on the number of energy audits undertaken in the UK between April 2010 and April 2013. In the absence of this we are able to provide some alternative metrics relating to the Carbon Trust.

The Carbon Trust's database on energy audits shows that between 2006 and 2011, a total of 8,547 organisations received a Carbon Trust audit; 1,671 of these organisations were large enterprises and 6,786 were SMEs. The database does not extend beyond 2011.

The Carbon Trust Standard is a voluntary certification that enables organisations to demonstrate success in cutting their carbon footprint. Since one of the criteria for achieving the standard is having an energy management system, it is a useful indicator in this context. At the end of 2013, 430 organisations held one or more of the Carbon Trust Standard certifications. This is similar to previous, recent years. Of this number, 335 are in the private sector and the remainder are in public sector. Of those 335, the Carbon Trust estimate less than 10% are SMEs.

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[12] http://www.scotland.gov.uk/Publications/2011/09/13091128/0

[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211471/130521_Energy_Audits_IA_v28_clean.pdf

1.3 Metering and billing

Smart Meters

The smart meters programme aims to roll out smart electricity and gas meters to all domestic properties (in accordance with the EU Third Internal Energy Package) and smart or advanced meters to smaller non-domestic sites in Great Britain by the end of 2020. The roll out of smart meters into homes across Great Britain will remove the need for estimated billing, help households better manage their energy consumption, facilitate faster switching between suppliers and drive a more vibrant and competitive market that will foster the development of new energy products and services. Near-real time information from smart meters will help put consumers in control of their bills, leaving them better placed to reduce energy consumption. The introduction of smart meters will mean energy networks will have more granular information upon which to manage and plan current activities and assist the move towards smart grids. As of 31 December 2013 large suppliers had reported to the UK Government that they were operating 265,155 smart meters in domestic premises[14].

In line with best practice and Article 9(2)(b) of the Directive, the Government has put in place a Data Access and Privacy Framework[15] that gives consumers control over who sees their energy consumption data, apart from where this is required for billing or other regulated duties. For example, network operators will be permitted access to half-hourly energy consumption data provided that they develop and submit for approval plans detailing how privacy will be ensured and what the data will be used for. This regulatory framework, informed by international experience, has been implemented by licence conditions that came in force in June 2013 and:

- Requires suppliers to get explicit (opt-in) consent in order to use their customers' energy consumption data for marketing purposes;
- Allows suppliers to access monthly data for billing and for the purposes of fulfilling any statutory requirement or licence obligation (such as settlement, or preventing theft);
- Allows suppliers to access daily data provided that the customer does not object to (i.e. opt out of) this ; and
- Requires that suppliers must receive explicit (opt-in) consent in order to access half-hourly data.

In accordance with Article 9(2)(a) and 9(2)(c), the second Smart Meters Equipment Technical Specification (SMETS 2)[16] will ensure meters are capable of providing customers with near real-time information on their energy usage and storing up to 24 months of consumption data as well as up to 3 months of half hourly export data. For the purposes of implementing Articles 9(2)(d) and 10(2)(b) of the Directive the Government introduced licence conditions in spring 2014 to ensure that if domestic customers request metering data on their electricity export and/ or electricity/ gas consumption, it will be made available to them by their supplier. A regulated

[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289132/Statistical_Release_Smart_Meters_Great_Britain_quarter_4_2013.pdf

[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43046/7225-gov-resp-sm-data-access-privacy.pdf

[16] https://www.gov.uk/government/consultations/smart-metering-equipment-technical-specifications-second-version

industry code (the Smart Energy Code[17]) is in force and will enable authorised third parties (e.g. energy service companies and switching websites) to access consumers' import and export data with the consumer's permission so they can provide services that will aid the informed comparison of energy tariffs by customers.

Consumers are the focus of the smart meter installation process. A smart meter installation Code of Practice,[18] which came into force on 30 November 2012 through licence conditions, will ensure that consumers are given information at the time of installation about how their meter and In-Home Display can help them to save energy and so fulfils the requirements of Article 9(2) (e) of the Directive.

Northern Ireland

In July 2012 the Department of Enterprise, Trade and Investment (DETI) Minister announced that Northern Ireland would proceed with an electricity only smart meter rollout by 2020[19]. A Cost Benefit Analysis of a long term smart metering deployment scenario for Northern Ireland has been carried out by the Northern Ireland Authority for Utility Regulation (NIAUR) and indicated a marginally positive NPV for electricity meters only.

Currently, for the purposes of implementing aspects of Articles 9 and 10 of the Directive that relate to smart metering, DETI will introduce legislation to allow the Utility Regulator to introduce licence conditions that will apply once smart metering is introduced in Northern Ireland.

NIAUR is currently preparing a consultation document and intend to consult in late spring 2014, focusing mainly on the scope, governance and roadmap required to achieve a smart meter rollout in Northern Ireland in line with the EU 2020 target. The consultation will consider issues such as the communications protocol; the role of prepayment meters in a rollout; and the timeframe for implementation. DETI will consider privacy issues as the nature of the rollout is further developed.

Heat Metering

District heating ('heat networks') in the UK is a small sector. The amount of heat supplied to buildings in the UK via heat networks is around 2% of domestic, public sector and commercial heat demand[20] and there are approximately 2,000 schemes in the UK.[21]

The most recent study of heat networks in the UK revealed that, for mixed end user city type schemes operated by a private company, all of the non-dwellings (ie the large heat loads) have revenue standard metering installed and any nodes supplying dwellings will have at least one heat meter at development level. This results from the commercial need to recover investment, fuel and operating costs from the sale of heat.

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17 https://www.ofgem.gov.uk/ofgem-publications/57316/smartmeteringinstallationcodeofpractice.pdf

18 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43107/2545-smip-licence-conditions-consultation.pdf

19 Gas smart metering is not economically viable mainly due to the fact that the costs of a gas smart meter rollout would have to be met by only a small number of consumers, as the gas market is not yet mature enough in Northern Ireland. The costs and benefits for gas smart metering will be revisited around 2015.

20 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190149/16_04-DECC-The_Future_of_Heating_Accessible-10.pdf – page 39

21 Databuild, 2012, Catalogue of District Heating Schemes, with DECC additions

However, the study concluded that it was difficult to say how many dwellings are served by individual heat meters. We estimate that approximately 25% of existing residential-led heat networks schemes have heat meters installed. The charging mechanisms for the remaining 75% are based upon apportionment or a points-based system. Individual heat metering is being installed in new developments, particularly in the housing sector. An earlier study in 2007 indicated that 77% of dwellings in the social housing sector connected to a heat network did not have heat meters.[22]

The UK's heat strategy

The Government has identified heat networks as having an important role to play in the transition to low carbon heating. Heat makes up around half of the energy consumption in the UK and contributes around a third of the UK's greenhouse gas emissions. Heating within the domestic sector accounts for approximately 85% of UK domestic energy use (2012), and around 27% of UK total energy use (2012).[23] The Government is supporting the deployment of district heating through a number of actions set out in the March 2013 publication: "The Future of heating: Meeting the challenge".[24]

In Scotland, heat policy is devolved and the Scottish Government is consulting on support for district heating in its Heat Generation Policy Statement.[25] Key measures include setting a target for heat delivered by district heating and extending financial support.

Regulation of heat networks

The Government's implementation of the Directive's requirements in this area is guided by the importance of giving heating, cooling and hot water customers greater control over their consumption, and consequently costs and billing. Meters provide a direct financial incentive to reduce demand, increase awareness of energy use and result in a more equitable allocation of costs between customers. Effective implementation will enable heat network operators to gather information on heat losses and better manage their systems. The implementation of the Directive's measures will support the Government's overall ambitions for the expansion of the heat networks sector in the UK.

The heat networks sector as a whole is not regulated in the same way as gas and electricity markets. The Government will introduce legislation to implement the Directive's requirements in this area. There are also complementary industry-led activities seeking to introduce a consumer protection scheme and establish common technical standards that will support the aims of the Directive, as these apply to heat networks.

The Government's new regulations will require heat and cooling network operators to take the lead in implementing the requirements contained in Articles 9(1), 9(3), 10 and 11 of the Directive. The regulations will require network operators to establish the extent of metering and billing information across their networks. Some requirements are subject to tests of cost-efficiency and technical feasibility. The Government is producing guidance on the criteria and application of these tests; this will ensure consistency of approach and help to reduce the administrative burden on heat network operators in meeting the Directive's requirements.

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[22] DECC (2013). ECUK, Overall Tables 1.07, provisional 2012 levels. Based on 36,542 of domestic heat end use, with 43,153 total domestic consumption (thousand tonnes of oil equivalent). http://www.chpa.co.uk/medialibrary/2011/05/18/241aecd2/DEFRA%20heat%20metering%202007%20inc%20DH%20survey.pdf

[23] https://www.gov.uk/government/publications/the-future-of-heating-meeting-the-challenge.

[24] https://www.gov.uk/government/publications/the-future-of-heating-meeting-the-challenge.

[25] http://www.scotland.gov.uk/Resource/0044/00445639.pdf

The Government will be appointing a scheme administrator to monitor and support compliance. The scheme administrator will have several key regulatory responsibilities, including:

- Undertaking, or commissioning through a third party, a system of monitoring of scheme notification and monitoring for compliance, including through sample survey and site visits;
- Responsibility for the central guidance on technical feasibility and cost-effectiveness, though the Government will be responsible for commissioning the first template for this guidance;
- Responsibility for scheme enforcement.

Billing and Costs of Access to Information

Ensuring that energy customers receive frequent, accurate bills is a priority for Government. That is why we have placed legal obligations upon suppliers to roll out smart meters to all domestic premises and smart or advanced meters to smaller non-domestic sites by 2020. In addition to this, we already have a number of measures in place to ensure that bills are frequent, accurate and clear.

Accuracy and frequency of bills

There are a number of rules governing metering and meter readings within Great Britain. Under the standard licence conditions (SLC) for gas and electricity supply to both domestic and non-domestic customers, suppliers must take all reasonable steps to ensure they take a meter reading at least once every two years and accept meter readings when customers provide them. Suppliers are also required to take all reasonable steps to reflect the meter reading in the next bill or statement of account sent to the customer.

Suppliers also have a commercial incentive through an industry code to meet a target of 97% of meters read once a year or more with financial penalties if they fail to meet this.

Bills are calculated on the basis of a meter reading taken by a representative of the supplier, or the customer himself, or an estimate of the customer's use during the billing period. That estimate is based on previous use. In general, suppliers seek to read meters themselves at least once in every 12-month period with many seeking meter reading on a quarterly basis. In addition, suppliers are increasingly encouraging customers to provide their own meter reading by telephone or the internet.

In order to comply with Article 10(1), the UK is amending licence conditions for the supply of gas and electricity in the GB market to ensure that suppliers provide customers with bills based on actual consumption at least once a year. Suppliers will be able to meet this requirement either through their own meter reading or through a reading supplied by the customer.

Domestic gas and electricity customers using basic credit meters are generally billed (or where they pay by direct debit, receive a statement) for gas and electricity on a quarterly basis. In order to ensure that the GB market complies with Article 10(1), the UK is amending licence conditions to require suppliers to provide customers with billing information at least twice yearly and quarterly upon request or if they receive electronic billing.

Receiving billing information

Paperless and online billing is also popular and is widely available across the market. Ofgem, the independent regulator of the gas and electricity markets, has recognised the significance of online account management by allowing suppliers to offer it to customers as one of only two cash discounts allowed under its domestic retail market reforms.

In order to comply with Article 10(3)(b) and ensure that electronic billing remains an option for customers the Government is introducing licence conditions requiring suppliers to offer the option of online account management.

Suppliers are already required to provide domestic customers with their bills free of charge. Charges related to energy use must be incorporated into a standing charge or single unit rate. This prevents suppliers from levelling an additional charge for bills and provides clear pricing which is easy to compare, in line with Article 11(1).

Clarity of bills

As required by Article 10(3)(b), customers already receive, on request, a clear and understandable explanation of how their bill was derived. As part of the recently introduced domestic Standards of Conduct,[26] suppliers must give information (whether in writing or orally) which is complete, accurate and not misleading and is communicated in plain and intelligible language.

As is appropriate under Annex VII, paragraph 1(2), consumption data comparing energy usage in one billing period with the same period the previous year is already provided on domestic customers' energy bills or statements; or, for those customers with online account management, electronically. Furthermore, where a customer requests that a supplier pass on their historic consumption data either to them or any other person, suppliers must comply with this request free of charge as required by Article 10(3)(a).

Existing metering and billing arrangements also provide domestic customers with clear and understandable information about current actual prices and actual consumption in line with Annex VII, paragraph 1(2). Standard supply licence conditions for electricity and gas require suppliers to notify domestic customers of a unilateral change to a contract to increase charges or any other charge that significantly disadvantages the customer.

Provision of information to customers

In terms of the provision of contact details for energy efficiency organisations under Annex VII, paragraph 1(2), suppliers are required to maintain and provide information about the efficient use of energy to enable customers to make informed judgements about energy efficiency, together with details of sources of further energy efficiency information. This information must be provided free on request.

Working with Government, the trade association for the industry, Energy UK, has launched a website, 'Compare my Energy', which helps consumers compare how energy efficient their home is with people in similar houses in their local area as recommend by Annex VII paragraph 1(2).

Northern Ireland

Suppliers of gas and electricity are subject to a number of requirements, through their licence conditions, in relation to the provision of billing and billing information to customers. Amongst other things, they are required to:

- Provide their domestic customers with a bill or statement on at least an annual basis which must show the amount of electricity consumed since last bill or statement;

[26] https://www.ofgem.gov.uk/publications-and-updates/implementation-domestic-standards-conduct-decision-make-licence-modifications

- Include details in the bill of the name of the tariff, the unit rate, any discount or premium applied, the total charges applicable setting out clearly any standing charges and showing charges both inclusive and exclusive of VAT, and the amount of gas or electricity consumed since the last bill or statement;
- Calculate bills based on meter readings, or based on an estimate if no meter read is available. Suppliers must make reasonable endeavours to take an actual meter reading;
- After providing an estimated bill, give customers details of how to undertake and register a meter reading themselves. A self-read must be reflected in the next bill, and where requested, an updated bill should be sent;
- Provide a choice of payment methods;
- Provide consumption data on request.

In December 2013, DETI issued a public consultation on its proposals for amending the existing requirements on Northern Ireland suppliers in order to ensure compliance with the gas and electricity billing and metering aspects of the Directive. The main proposals include requirements for:

- Billing information to be provided to all customers (not just domestic customers) twice yearly;
- The option for a consumer to submit a self-read to be offered before a bill based on an estimate of the licence holder is issued;
- Information on the energy billing and historical consumption of final customers to be provided to energy service providers as well as suppliers;
- Final customers to be offered the option of electronic billing information and bills;
- Bills and billing information to be provided to final customers free of charge.

DETI will be introducing regulations in June 2014 that will ensure compliance with the gas and electricity billing and metering provisions of the Directive in Northern Ireland. The regulations will implement the proposals set out above.

1.4 Consumer Information Programmes and Training

In our Energy Efficiency Strategy the Government recognised that a lack of good quality, trusted information is one of the key barriers to energy efficiency take up. The Government has introduced a range of policies to help tackle this barrier and supports a number of training and awareness-raising initiatives.

Information about existing energy efficiency mechanisms, financial and legal frameworks is widely available online via the GOV.uk website. Government also commissions research and evaluation projects to better understand how behavioural change can lead to savings in energy use for domestic consumers and SMEs. In 2013 the Government began a Heating Controls Trial to study the impact of trusted advice on managing heating controls in homes. A project with ENWORKS to better understand the barriers to energy efficiency faced by SMEs has also been commissioned. Such studies help inform our development of forward-looking, innovative policies.

The UK will be introducing legislation in June to ensure that the requirements of Article 17 continue to be met.

Consumer Information

The roll out of **smart meters** into homes across Great Britain will require installers to visit around 30 million premises by 2020, and presents energy suppliers with an opportunity to engage their customers on energy efficiency, as recognised by Article 12(2)(b). Energy suppliers are required to adhere to an Installation Code of Practice[27] when installing smart meters. This Code compels suppliers to demonstrate the smart metering system (including the in home display) and offer energy efficiency advice, including highlighting sources of further information.

The **Green Deal** has a central role to play in raising consumer awareness of the benefits of installing energy efficiency measures; the Green Deal assessment provides the perfect opportunity for targeted advice to be given to consumers, as required by Article 17(2). On 2 December 2013, the Government announced plans to make the Green Deal more simple and accessible to consumers.[28]

The Government recognises the vital role played by Local Authorities in driving awareness and uptake of energy efficiency measures[29]. In July 2013 the Government launched a new £20 million fund to help local authorities drive street-by-street delivery of the Green Deal. In April 2014, it was announced that this funding has been increased to £88 million and will be awarded to 24 local authorities, helping around 32,000 households install energy efficiency home improvements.[30]

To support the development of the Green Deal and ECO, the Government contracted the **Energy Saving Advice Service** to provide households with access to impartial, free advice on energy efficiency measures. The advice service signposts callers to a wide range of organisations that can help install energy-saving measures in their homes and reduce their fuel bills. ESAS helps the UK comply with Article 12(2) and 17(1) of the Directive.

Awareness-raising and Training Initiatives for Citizens

As required by Article 17(4), the Government supports a range of awareness-raising and training initiatives which highlight the benefits of energy efficiency. On 21 November 2013 the government sponsored three new awards at the **Green Economy Awards**. The Awards recognised excellence in environmental responsibility and reconfiguration of business models around sustainability principles.

In addition to this, the government held the **Big Energy Saving Week**, a national campaign to help consumers cut fuel bills and get all the financial support they are entitled to, from 27 – 31 January 2014. The Big Energy Saving Week is a joint project between Citizens Advice, Government, energy suppliers, Energy Saving Trust, Acre, Age UK and other voluntary and charitable organisations.

As part of the Green Deal, the Government has supported the development of a national '**Open Homes' network** making it easy for people to find and see homes that have been improved by energy saving retrofits.

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[27] Suppliers are obliged by Conditions 41 and 42 in the Standard Conditions of Electricity Supply Licences and Conditions 35 and 36 in Gas Supply Licences to adhere to the Code https://www.ofgem.gov.uk/ofgem-publications/57316/smartmeteringinstallationcodeofpractice.pdf

[28] https://www.gov.uk/government/news/streamlining-and-improving-the-green-deal

[29] As suggested in Article 17(4)

[30] https://www.gov.uk/government/news/support-for-local-authorities-to-keep-homes-warm-and-lower-energy-bills?jhbjkb

Funding

As recognised by Article 12(2), behavioural change can be promoted by fiscal incentives and access to finance, grants or subsidies. A range of policies in the UK aim to effect behavioural change in this manner. The **Green Deal Finance Company**, an industry led consortium with over 50 members, aims to deliver universal low cost financing to households for the installation of energy efficiency measures under the Green Deal. **ECO** works alongside the Green Deal, driving the uptake of measures which could not be fully financed under the Green Deal and helping low income households.

In December 2013, the Government announced a new package of incentives and support to encourage the take up of energy efficiency improvements for households, the domestic private rented sector and the public sector. The overall package is worth £180 million each year for three years from 2014-15.

The non-domestic **Renewable Heat Incentive** (RHI), introduced in November 2011, is a subsidy to promote the uptake of renewable heat technologies. Government has consulted on proposals to include energy efficiency measures as part of the eligibility requirements for the non-domestic scheme. In its consultation response,[31] the Government acknowledged that there is scope to introduce energy efficiency criteria into the scheme in the near future.

The Government launched a domestic scheme in spring 2014. To be eligible for the domestic RHI, all applicants will need to provide evidence that they have identified, through a Green Deal Assessment, which energy efficiency measures would be cost-effective for their property and have, at a minimum, installed loft insulation and cavity wall insulation where these measures are suitable and cost-effective.

Northern Ireland

Information and Training

The provision of consumer information and training is promoted by a range of schemes in Northern Ireland, in particular **Invest NI**.[32] In addition, electricity and gas suppliers have energy efficiency promotion conditions in their licences. The Energy Performance of Buildings enforcement authorities (largely District Councils) run regular **themed awareness raising events** and provide advice on compliance, including via a dedicated helpline. The Department of Finance and Personnel (DFP) also hosts awareness seminars when the Building Regulations are amended.

Information on energy efficiency measures is available at www.nidirecti.gov.uk/energywise and the Northern Ireland Bryson Energy Advice Line www.brysonenergy.org/advice.html

Funding

There is a range of funding available to encourage the uptake of energy efficiency measures in Northern Ireland. This includes the **Northern Ireland Sustainable Energy Programme** which provides grants for the implementation of energy efficiency schemes for domestic consumers. Funding is also provided for more specific measures aimed at vulnerable customers such as the **Warm Homes Scheme**, which provides a package of energy efficiency and heating measures aimed at reducing fuel poverty. **The Boiler Replacement Scheme** offers grants to low income households to replace old, inefficient boilers. This helps to address the dependence of the majority of households in NI that use oil as their main heating fuel by seeking to reduce overall energy consumption through the use of more efficient means.

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[31] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265855/Non-Domestic_Renewable_Heat_Incentive_-_Improving_Support_Increasing_Uptake_-_PUBLISHED.pdf

[32] See Energy Audits section of NEEAP

Interest free loans of between £3K and £400K are also available from Invest NI, in partnership with the Carbon Trust, to help companies install new energy efficiency equipment.

The **Northern Ireland Renewable Heat Premium Payment** is designed to help domestic householders afford renewable technologies to heat their home. Applicants must have basic energy efficiency measures in place i.e. loft insulation of 250mm and cavity wall insulation, where these measures are practical. This is a short term measure prior to the introduction of a Northern Ireland Renewable Heat Incentive for the domestic sector later in 2014. The non-domestic Renewable Heat Incentive was introduced in Northern Ireland in November 2012.

Scotland

Information and Training

An advice and support service is provided through a network of local advice centres, **Home Energy Scotland Advice Centres**, funded by the Scottish Government and managed by the Energy Saving Trust. Additionally, **Citizens Advice Scotland** provides advice and support on energy bills and signposting for further help on insulation measures through their network of local bureaux.

SMEs receive comprehensive information, advice and support from the **Resource Efficiency Scotland** programme. This programme brings together expertise in the management of energy, water and materials into a streamlined, holistic service.

Funding

There are a number of schemes which aim to encourage behavioural change by providing funding for energy efficiency measures. These include the **Home Renewables Loan scheme**, which provides support for householders to install domestic renewable technologies, and the **Climate Challenge Fund** which provides funding for community groups that are tackling climate change through community led projects.

The Scottish Government also offers loans to SMEs for energy and resource efficiency measures or renewable technologies. The **Resource Efficient Scotland SME loans** scheme provides loans of £1,000 to £100,000 to install renewable energy technologies or measures that reduce energy consumption to SMEs, private landlords, not-for-profit organisations and charities, including for boiler replacements, heating controls and wood fuel heating systems. Loans for energy efficiency measures are interest free.

Wales

Information and Training

From spring 2014 the Welsh Government will be providing an i**ntegrated resource efficiency support service** aimed at the domestic, community and public sectors, and strengthening the service to businesses through Business Wales. The service will replace the current grant funded services to EST and Carbon Trust, and will draw on a broader range of specialist providers to address a range of user driven requirements.

Funding

The Welsh Government provides funding for household energy efficiency through its energy efficiency programme that includes **Nest**, a fuel poverty scheme that provides advice and support as well as free installation of energy efficiency measures for those in fuel poverty and **Arbed,** an area based scheme that installs measures in deprived communities. In addition to this the Welsh Government has increased the funding in its energy efficiency programme to attract spending under the Energy Company Obligation within Wales. The Welsh Government

has also supported the Carbon Trust to provide interest free loans for energy efficiency measures, and has grant funded the **Sustainable Living Grant Scheme,** which pilots community and locality based approaches to energy efficiency. A review in early 2014 of the current availability of funding for resource efficiency and microgeneration will inform Wales' future provision.

1.5 Availability of qualification, accreditation and certification schemes

Though UK businesses are increasingly integrating energy efficiency into their operating models, a skills gap has, in some cases, prevented businesses from making energy efficiency improvements.[33] The Government has taken action in a number of areas to close this gap and support recognised and trusted qualification, accreditation and certification schemes. We recently supported the **Build Up Skills UK** project, led by the Sector Skills Council. This project will identify skills gaps and implement long-lasting training infrastructure to improve the skills related to the installation and maintenance of building energy efficiency technologies.

If the UK is to enjoy the benefits of greater energy efficiency, we need to make sure that all organisations responsible for the delivery of our energy efficiency policies have the appropriate qualifications, accreditation and certification. The Government is committed to supporting the development of appropriate schemes. Information on available schemes is widely available online.

Energy Service Providers

Strict qualification and accreditation requirements have been developed for **Green Deal** providers. The Government commissioned Asset Skills, the appropriate Sector Skills Council, to develop a suite of National Occupational Standards (NOS) for Green Deal Advisors (GDAs). These build on the existing suite of Energy Assessor NOS and qualifications. As part of the accreditation framework all GDAs must demonstrate competency against the National Occupational Standards for GDAs.[34]

The United Kingdom Accreditation Service (UKAS) oversees the certification framework for GDAs. All providers of Green Deal Advice Services need to be certified by an approved, independent Certification Body against the scheme standards[35] and adhere to a strict code of practice.

Energy Performance Certificates and **Display Energy Certificates** are produced by accredited energy assessors using standard methods and assumptions about energy usage. This means that the energy efficiency of one building can easily be compared with another building of the same type, allowing prospective buyers and tenants to take energy efficiency and, in the case of dwellings, fuel costs into consideration. The skills and knowledge required to carry out an energy assessment are outlined in the National Occupational Standards (NOS) for Energy Assessors, available from Asset Skills.[36]

Energy assessors must be registered[37] with a Government approved Accreditation Scheme operator before they can commence working as an energy assessor. The Accreditation

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[33] http://www.cbi.org.uk/media/934998/shining_a_light_-_uncovering_the_business_energy_efficiency_opportunity_cbi_report_aug_2013_screen.pdf

[34] More detail available at www.assetskills.org/GreenSkills/GreenSkillsNOSProject.aspx

[35] The standards are set out in the Specification for Organisations providing the Green Deal Advice Service and the Specification for Certification Bodies Certifying the Green Deal Advice Service.

[36] For more information: www.assetskills.org/GreenSkills/GreenSkillsEnergyAssessment.aspx

[37] Scotland operates a separate Register and set of accreditation bodies. Arrangements in England, Wales and Northern Ireland are largely the same.

schemes cover all aspects of EPCs, Display Energy Certificates for buildings occupied by public authorities and air conditioning inspection reports.

Energy Auditors

In addition to the qualification routes for EPCs and Green Deal assessors, the market in the UK provides a wide range of training and qualification opportunities for energy auditors, including post-graduate level qualifications in energy and environmental management. Established bodies such as the Institute for Energy Management and the Energy Institute also peer-review registers of energy auditors.[38]

The UK Government has commissioned the UK's national standards body (BSI) to develop PAS 51215, working with industry. PAS 51215 will provide a benchmark setting the level of competence for lead energy efficiency auditors who will be deemed qualified to conduct energy efficiency audits in compliance with the UK's implementation of Article 8(4) of the Energy Efficiency Directive. We expect a range of professional bodies in the UK which currently issue qualifications for professional auditors to have their existing qualifications assessed against this standard.

Energy Managers

The UK has a well-established framework for energy managers with a variety of training schemes and education packages offered by the Energy Institute and the Institute of Environmental Management Assessment (IEMA). IEMA members are also required to sign a professional code of conduct.

Installers of energy-related building elements

The installation of new building elements (such as windows, a new roof, boiler or lighting system) must meet the standards in the Building Regulations. This means the work is either checked by Local Authority Building Control or a private Approved Inspector, or carried out by a 'Competent Person'.[39] In Scotland, where such work requires a building warrant, verification of building work is the responsibility of local authorities alone.

Air conditioning systems with an effective rated output of more than 12kW require a regular inspection at intervals not exceeding five years. This will include systems comprising individual units which are less than 12kW but whose combined effective rated output is more than 12kW. Air Conditioning Inspection Reports (ACIRs) are produced by accredited air conditioning energy assessors.

Green Deal installers are certified through authorised Certification Bodies for the different Green Deal measures they wish to install. The certification body will register the installer with the Oversight and Registration Body[40] and license them to use the Green Deal Quality Mark. Green Deal Installers must:

- Be certified by a Green Deal accredited Certification Body as meeting the standard (PAS 2030) for the measures they wish to install;
- Comply with the conditions in the Green Deal Code of Practice;
- Keep clear records of work done and allow monitoring of installation work when requested.

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[38] For example: IEMA's register of environmental auditors, and the Energy Institute's Register of Professional Energy Consultants).

[39] A 'Competent Person' is an installer who is a member of a 'Competent Persons Scheme', meaning they have been assessed as competent to self-certify that their work meets the Building Regulations

[40] https://www.gov.uk/government/groups/green-deal-oversight-and-registration-body

The Devolved Administrations

In most cases, the above schemes apply to the whole of the United Kingdom (or Great Britain in the case of the Green Deal). In particular, the Devolved Administrations have a shared interest with regard to National Occupational Standards (NOS) as these are funded and developed across all four nations. The Devolved Administrations are represented on both the UK NOS Panel and UK NOS Governance Group to ensure that consultation on NOS is carried out with a representative sample of employers across the UK.

Northern Ireland

The **Warm Homes Scheme** aims to make homes warmer, healthier and more energy efficient, offering a range of insulation measures to householders that are eligible. Under the Warm Homes scheme, a householder may be able to receive help with the measures such as cavity wall insulation, loft insulation, hot water tank jacket and energy advice. The scheme mandates the use of the following qualification, accreditation and certification schemes: Gas Safe; OFTEC; HETAS or NICEIC; or equivalent bodies.

The **Northern Ireland Sustainable Energy Programme** requires that in order for bidders to register they must provide a statement of capability, demonstrating evidence of their ability to complete the work and information confirming that all products are British Standard approved. In addition all advisers under the Bryson telephone advice line must be suitably accredited to deliver energy efficiency advice.

1.6 Energy Services

The Government is committed to creating the right environment for the energy services market to develop. We already have a number of measures in place, but will be undertaking further work and introducing legislation where necessary to fulfil the requirements of the Directive.

Promotion of the Energy Services Market

In order to promote the energy services market and access for Small and Medium Enterprises (SMEs) to this market the Government will host the following information on its GOV.uk website, all of which will be freely available to access and download:

- A 'model' Energy Performance Contract, as required by Article 18(1)(d)(i). To help ensure that this model contract is used appropriately and encourages access for SMEs, the Government will also be producing a Guidance Note for the contract.
- A Best Practices Guide to Energy Performance Contracting as required by 18.1(d)(ii). This guide will consist of a step by step process and will clearly identify the clauses that should be included to guarantee energy savings and final customers' rights, as per requirement 18(1)(a)(i).
- An updated version of its 2012 Guide to Financing Energy Efficiency in the Public Sector, to satisfy the requirement of Article 18(1)(a)(ii). The Government will also be publishing a Guide to Financing Energy Efficiency in the Private Sector.
- A list of available energy service contracts, as required by Article 18(1)(a)(i).

The Government plans to promote the availability of this information.[41]

[41] As per requirement 18(2)(a)

Information about the Market and Providers

Following the Governments' "Digital by Default" guidance, the UK will be publishing a review of the energy services market (see Annex C) on GOV.uk, where it will be freely available to download.

The development of **quality labels**[42] is beneficial for energy service providers (including SMEs) and consumers. A quality label acts as a seal of approval for energy service providers, giving consumers confidence that work will be carried out to a high standard. However, these benefits are undermined if quality labels become confusing and ubiquitous. The Green Deal Quality Mark has been developed in response to calls from the market to simplify the complex landscape that has been created by the existence of a large number of quality marks.

Access to the market for SMEs will be further supported by the maintenance of a **list of available energy service providers**, as required by Article 18(1)(c) which will be hosted on the GOV.uk webpage. A link to this list will be included in future NEEAPs.

Supporting the proper functioning of the market

The Government is committed to supporting a competitive energy services market. The United Kingdom has long-established routes for dispute resolution and a comprehensive legal framework which prohibits anti-competitive practices.

The Handling of Complaints

Where a complaint or dispute occurs in the energy services market, parties to the dispute have recourse to existing arbitration services. The Competition and Markets Authority, Office of Gas and Electricity Markets (Ofgem) and the Energy Ombudsman, should collectively cover the energy services market. Contractual disputes can also be referred to mediation through the Centre for Effective Dispute Resolution, an independent, non-profit charity which provides mediation services.

Market Regulation

The UK operates in a free market space. As such, there are no barriers preventing independent market intermediaries playing a role in stimulating market development on the demand and supply sides.[43]

The UK has legislative safeguards which prevent competitive distortions of the energy services market and is therefore compliant with Article 18(3). Section 2 of the Competition Act 1998 prevents agreements which preclude, restrict or distort competition; and Section 18 of the Act prevents conduct which amounts to the abuse of a dominant position in the market. The Competition and Markets Authority is responsible for enforcing the Competition Act.

Northern Ireland

The Utility Regulator, the Office of Fair Trading and the Competition Commission ensure that the energy market is fair and competitive. Part 4 of the Enterprise Act enables the Office of Fair Trading and the Utility Regulator to investigate markets and, if they are concerned that there may be competition problems, to refer those markets to the Competition Commission. The Competition Commission is required by the Enterprise Act to decide whether any feature or combination of features in a market prevents, restricts or distorts competition. If the Competition Commission finds that features of a market are harming competition, it must seek to remedy the harm either by introducing remedies itself or recommending action by others.

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[42] As per requirement 18(1)(b)

[43] As per 18(2)(d)

Energy Efficiency Barriers

The Government issued "A Call for Evidence" in February 2012[44] which asked for information on the barriers resulting in under-investment in energy efficiency. In November 2012 the Government published its *Energy Efficiency Strategy*, which identified four barriers to take up of energy efficiency opportunities. These barriers are described in Box 2:

Box 2: Barriers to energy efficiency take up

Embryonic markets: The UK already has an energy efficiency market but it is small relative to the size of the opportunity. There are significant economic benefits to be realised from growing this market and making energy efficiency a mainstream activity.

Information: There is currently a lack of access to trusted and appropriate energy efficiency information. Where information is available it may be generic and not tailored to specific circumstances, which means that enterprises are not able to fully assess the benefits of an energy efficiency investment. While information on overall energy consumption is available, it is often difficult to identify which specific energy efficiency improvements should be prioritised.

Misaligned financial incentives: Those investing in energy efficiency measures are not always the ones receiving the direct benefit. For example, where an office space is rented out and the tenants are responsible for the energy bill, it is the tenants, not the landlords, who would receive the benefits of energy efficiency measures. In terms of wider benefits such as improved security of energy supply, those individuals making the investment will not always appreciate the benefit to them.

Undervaluing energy efficiency: Partly as a result of the lack of trusted information, the long term benefits of improved energy efficiency are often regarded as less certain. Consequently, energy efficiency is undervalued relative to other investment options and not prioritised as it might otherwise be.

Action is being taken to address all of these barriers.[45] The planned and existing policies that address each barrier are highlighted in the Energy Efficiency Strategy and the Energy Efficiency Strategy Update. The UK is committed to a rolling programme of action to address these barriers.

1.7 Other energy efficiency measures of a horizontal nature

Barriers to Energy Efficiency in Great Britain

Article 19 requires Member States to evaluate and take appropriate measures to remove barriers to energy efficiency, in particular as regards split incentives and the existing public purchasing, budgeting and accounting framework. Our commitment to addressing the barriers to energy efficiency was discussed in the previous section.

[44] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42899/4286-call-for-evidence-energy-efficiency-deplyment-off.pdf

[45] As per requirement 18(2)(b)

Split Incentives

This barrier is a particular problem in the private rented sector. The Government has already taken action to encourage the installation of energy efficient measures in rented properties. As it is the bill payer who makes the Green Deal repayments through bill savings, the Green Deal helps to overcome this barrier. Additionally, the Landlords Energy Saving Allowance, a financial incentive, allows landlords of domestic rented property to claim tax relief of up to £1,500 per property for the costs of buying and installing energy-saving products.

The Energy Act 2011 contains provisions for regulation to drive the take-up of energy efficiency improvements in the domestic and non-domestic private rented sectors. The use of these regulation-making powers is conditional on there being no net or up-front costs to landlords. Provided that these conditions are adhered to, the Government intends to use these powers for England and Wales so that:

- Domestic private landlords will not be able to unreasonably refuse requests for consent to energy efficiency improvements from their tenants, where financial support is available, such as Green Deal finance or ECO, with the first tenants' energy efficiency improvements regulations coming into force by 1 April 2016.
- There will be a minimum energy efficiency standard for privately rented housing and non-domestic property, with the first domestic and non-domestic energy efficiency regulations coming into force by 1 April 2018. To ensure there are no net or upfront costs to landlords, a property below the minimum standard may be let where all improvements possible within the Green Deal's Golden Rule are undertaken, taking into account any funding support available such as ECO.

Public purchasing, budgeting and accounting

A working group was established in 2012, attended by DECC, the UK Green Investment Bank, Local Partnerships and HM Treasury, to analyse the specific accounting rules governing energy efficiency improvements and look at available financing and structuring options.[46] The group concluded that there are no specific legal or regulatory provisions, or administrative practices, regarding public purchasing and annual budgeting and accounting that act as a barrier to investment in energy efficiency measures, although guidance on the precise accounting treatment of energy efficiency projects may be helpful.

In addition DECC and the UK Green Investment Bank ran a financing workshop in March 2014 to investigate what more could be done to help facilitate investment in public sector energy efficiency. It was attended by senior representatives from the public sector, including local authorities, and by private sector accountants and lawyers. As a result of this workshop DECC is considering preparing a toolkit to assist public sector organisations develop business cases for energy efficiency investments.

[46] This work is detailed in the paper "Barriers to Energy Efficiency Investment in the Public Sector" which can be presented to the Commission if requested.

Barriers to Energy Efficiency in Northern Ireland

The four barriers identified in Box 2 are common to Northern Ireland but there are differences to the extent that each applies in Northern Ireland due to its unique geography, circumstances and devolved responsibilities for energy policy.

Tackling the Barriers

NI has various policies and programmes in place to tackle these barriers and action is being taken to address all of these through an on-going rolling programme. The main policies include:

- Invest NI Resource Efficiency Audits;
- Bryson Energy Advice Line & "Energywise";
- Warm Homes Scheme;
- Boiler Replacement Scheme;
- Northern Ireland Sustainable Energy Programme;
- Northern Ireland Renewable Heat Premium Payment;

Details of these schemes are provided throughout the document.[47]

The Department of Social Development (DSD) is currently consulting on the introduction of a more targeted approach to delivering energy efficiency measures to low income households with a new scheme planned for later in 2014. The "Affordable Warmth" scheme will offer assistance to those homes in the most severe fuel poverty.

Split Incentives

Northern Ireland has already addressed the barrier of split incentives between landlords and tenants. The Private Tenancies Order 2006 states that a tenant must obtain the landlord's consent to carry out alterations to the property but this consent cannot be unreasonably withheld.

The CRC Energy Efficiency Scheme is a mandatory scheme aimed at improving the energy efficiency of large public and private sector organisations. Where a landlord receives an energy supply and provides part of that supply to its tenants (e.g. In a multi-let building), the landlord must observe the requirements of the CRC scheme and will be responsible for making energy efficiency improvements. Conversely, where the tenant has a direct agreement with the energy supplier, the CRC liability for energy use will be allocated to the CRC participant to which the tenant belongs, if any. In Phase 2 of the CRC scheme, the tenant will have responsibility if their lease lasts for at least 30 years.

[47] See in particular the "Consumer Information and Training" section

Financing Facilities

The UK has established a number of financing facilities and does not deem an Energy Efficiency National Fund to be necessary. These financing facilities allow funds to be better allocated and bring together expertise in specific areas. Consequently, the costs of administration of the projects are reduced, as is the time taken for the benefits to reach the end consumer. There is a wide range of energy efficiency financing mechanisms available to domestic consumers; these include the Green Deal, ECO, the Landlords' Energy Saving Allowance and the domestic RHI.[48] In addition to these schemes, there are a number of financing mechanisms available to non-domestic consumers, including the Climate Change Agreements, the CRC Energy Efficiency Scheme,[49] Enhanced Capital Allowances and the Green Investment Bank.

The Enhanced Capital Allowance (ECA) Scheme is a key part of the Government's programme to manage climate change. It provides businesses with enhanced tax relief for investments in equipment that meets published energy-saving criteria.

The **UK Green Investment Bank** (GIB) was established by the Government in October 2012. The GIB is the world's first investment bank dedicated to mobilising capital to green the economy with energy efficiency as one of its priorities. With government funding of £3.8 billion, the GIB invests in environmental-friendly infrastructure projects for which there is insufficient support from private markets. The GIB always invests alongside and on the same terms as private sector investors.

As of early April 2014, the GIB has backed a total of 25 projects, committing £1.3bn which will mobilise a total of £3.3bn of private sector capital when fully deployed.[50] The GIB has already committed £150 million to three specialist funds to make energy efficiency investments in the non-domestic sector.

The Government has taken a lead role in the development of the energy services market by increasing the support available through public sector finance schemes. **Salix Finance Ltd** is grant funded by DECC and provides interest free loans to the public sector. Salix received an additional £18 million from DECC in 2012/13. The Government has also allocated an additional £90 million over the next three years to build on the Salix scheme and provide loans to improve the energy efficiency of hospitals, schools and other public sector buildings.

The **RE:FIT** programme was pioneered by the Greater London Authority to deliver energy efficiency improvements to the public sector estate through Energy Service Contracts. Together with Local Partnerships, the Government is funding the initial England-wide rollout of RE:FIT. The Government's aim is that the national roll out of RE:FIT will become entirely self-financing and drive improvements in energy efficiency across the public sector.

[48] These policies are described in detail in previous sections.

[49] See Box 1 for details

[50] http://www.greeninvestmentbank.com/what-we-do/transactions-to-date.html

2. Energy Efficiency in Buildings

Please see Annex B for the UK's building renovation strategy.

Other energy efficiency measures in the buildings sector

The UK has a wide range of policies which encourage energy efficient renovations of the existing building stock. In addition to this, the Government is committed to introducing strict energy efficiency requirements for new buildings.

Zero Carbon Buildings

The Government will be implementing its "zero carbon homes" policy from 2016. This timetable has been developed following consultation, and in partnership with home builders, industry, local government and green stakeholders. The Government's position was reiterated in the 2013 Budget, alongside a commitment to consult on proposals for zero carbon homes 'Allowable Solutions'. This proposal allows developers to off-set some of the carbon emissions generated by new homes they build by investing in off-site carbon reduction schemes, and contributes to them meeting the zero carbon homes standard. That consultation closed in October 2013, and the Government's response will be announced in due course.

Building Regulations

Building Regulations are devolved across the four UK administrations but energy standards are broadly comparable in content, scope and in the levels of improvement delivered over past decades across in the UK.

England

Following public consultation, the Government announced a strengthening of Part L of the Building Regulations on energy efficiency requirements for buildings. The new regulations came into force on 6 April 2014 and require average reductions of 6% in CO_2 emissions for new homes and 9% for new non-domestic buildings compared to Part L 2010 regulations. These changes take the next step towards zero carbon buildings with an emphasis on improving fabric energy efficiency performance. Part L requirements for extensions to existing properties and for replacement windows and boilers have been strengthened considerably in recent years and no further changes are being introduced at present.

Northern Ireland

Northern Ireland introduced improvements to energy efficiency standards through Building Regulations in 2012. These improvements have delivered a 25% reduction in CO_2 emission for new buildings and certain extensions, compared with the policy standards set in 2006. Work is underway to introduce the policy standards of England's Part L 2014 into the Northern Ireland Building Regulations in 2015 thus delivering further energy efficiency improvements.

Scotland

Following improvements introduced in October 2010, Scottish Ministers have announced further improvements to energy standard in building regulations, to be implemented in October 2015. New homes built to the 2015 standards will deliver a 21% aggregate reduction in CO_2 emissions, when compared with 2010 levels. New non-domestic buildings will deliver a 43% aggregate reduction in CO_2 levels in comparison to 2010 levels. These improvements will deliver commensurate reductions in energy demand.

Wales

Following public consultation, the Welsh Government has announced that there will be changes to the CO_2 emission rates of all new buildings in Wales from July 2014. All new homes will require similar improvements to those in England. In addition mandatory fabric u-value standards have been introduced and improved. New non-domestic buildings will be subject to a 20% reduction in CO_2 levels in comparison to Part L 2010 levels. Furthermore, non-domestic buildings will also have to meet improved fabric standards for walls and roofs.

The Code for Sustainable Homes

The Code for Sustainable Homes was published in 2007 and currently applies in England and Wales. The Code provides a single voluntary national standard to guide industry in the design and construction of sustainable new homes, and also enables the sustainability of new homes to be measured against nine categories. These are generally set above or in addition to the current Building Regulation minima. The only circumstances in which the Code can be enforced are where:

a. local councils require developers to comply with the code by including a requirement in their planning policy; and

b. where affordable housing is funded by the Homes and Community Agency.

By the end of December 2013, nearly 144,000 homes were confirmed to have been constructed to Code standards. The majority of Code homes constructed to date have been built to Code level 3, which is now equivalent to the minimum energy efficiency level required by Part L of the Building Regulations. The Government has also committed to implement a zero carbon homes policy from 2016, which will supersede the energy efficiency standards in the Code. In January 2014, the Prime Minister announced that any necessary remaining standards would be consolidated as far as possible into the Building Regulations. The Government will be putting in place transitional arrangements to ensure that contractual commitments under the Code can be properly covered. A Written Ministerial Statement on the Housing Standards Review was published on 13 March 2014.

Northern Ireland

Prior to the introduction of the Building Regulations (NI) 2012 most new social homes in Northern Ireland were constructed to meet the code Level 3 standard of the Code for Sustainable Homes. As these new regulations introduced a minimum energy efficiency level which equates with that of Code Level 3, and indeed that of Part 'L' of the current Building Regulations 2010 in England, the Department of Social Development has therefore decided that new dwellings constructed under its Social Housing Development Programme will comply with PART 'F' of the new NI Regulations. Going forward it is anticipated that compliance with subsequent revisions to the NI Building Regulation, which pay consideration to the emerging standards in England, will be the main instrument setting minimum energy efficiency levels for all new housing in NI.

3. Energy Efficiency in Public Bodies

The Directive clearly recognises the exemplary role that public bodies can play in driving energy efficiency improvements in their buildings and the role of central government in encouraging best practice in other public bodies. The UK Government has long recognised the benefits of reducing energy consumption across its estate and is determined to lead by example. For example English and UK-wide Government departments and arms' length bodies reported a 14% reduction in greenhouse gas emissions in 2012-13 compared to a 2009-10 baseline, equivalent to estimated financial savings of £44 million.

3.1 Central Government buildings

Article 5 of the Energy Efficiency Directive requires Member States either to renovate, each year from 2014 to 2020, 3% of the floor space of their central government building stock in eligible buildings that does not meet minimum energy performance standards, or to take alternative measures to achieve equivalent energy savings by 2020 in eligible buildings owned and occupied by central government.

The UK's target

The UK has adopted the alternative approach provided under Article 5(6) of the Directive. It has calculated a target which, as required, is based on the energy savings that paragraphs 1 to 5 of Article 5 would generate. The UK has estimated the target saving to be achieved by 2020 at **163.6 Gigawatt hours (GWh)** and has notified the Commission of this target. The UK currently expects to deliver an amount of energy savings considerably in excess of the target (see below).

Box 3: Calculation of the target

In line with Article 5(6) the UK has calculated the size of the target using estimated energy consumptions of standard reference types of buildings before and after renovation. These estimates have then been applied to estimates of the floor area of the buildings stock for eligible central government buildings in English and UK-wide Government departments and in the Devolved Administrations. The UK has therefore not needed to produce an inventory in line with Article 5(5).

The total floor area included in the estimate, based on data on eligible central government buildings in English and UK-wide Government departments and in the Devolved Administrations, is 15,721,395m^2. Included within this total are eligible buildings located in the Devolved Administrations.

In line with Article 5(1) of the Directive, the UK has calculated the target to include buildings owned and occupied by central government with floor areas over 500m^2, lowering to 250m^2 as of 9 July 2015. It was not possible to separate out heated and cooled buildings in the target estimate. Also, in line with the provisions of Article 5(1), the UK has chosen to consider buildings as a whole and prioritise those with the lowest energy performance in the target estimate (where cost-effective and technically feasible).

In line with Article 5(2) the UK has chosen to exclude from its target estimate: listed buildings (the UK equivalent of buildings officially protected as part of a designated environment or because of their special architectural or historical merit); defence buildings apart from single living accommodation and offices; and buildings used as places of worship and religious activities.

While the Article allows Member States to take advantage of an excess of renovations in the three preceding or following years, the UK currently expects to deliver an amount of energy savings considerably in excess of the target, so has not needed to use this flexibility.

As allowed for under Article 5(4), the UK has counted towards the annual renovation rate new buildings that are occupied and owned as replacements for buildings demolished in any of the two previous years, or buildings that have been sold, demolished or taken out of use in any of the two previous years due to more intensive use of other buildings (i.e. estate rationalisation). The UK has excluded forecast estate rationalisation from the target by lowering the required target saving accordingly and has therefore also omitted it from the planned measures to achieve the target. Advice from the Commission on 19 November 2013 confirmed that this approach was reasonable. The estimated savings due to estate rationalisation are **106 GWh**.

Policies relied upon to meet the target

Under the alternative approach the main policies and measures being used to meet the target are the **Greening Government Commitments** (GGC) and separate initiatives in Scotland, Wales and Northern Ireland. The estimate below has been compiled on the basis of programmes for England, Scotland and Wales only.

The GGCs are a set of ambitious sustainability targets covering English and UK-wide government departments, their executive agencies and non-departmental public bodies. They run from 1 April 2010 to 31 March 2015 and require departments to reduce greenhouse gas emissions by 25% relative to a 2009/10 baseline. In December 2013 the Government published a report setting out the progress made by central government departments and this showed that the Government has succeeded in reducing emissions by 14%.

The types of measures which are included within the GGCs include behavioural change, facilities management, estate management, installing energy efficient Information Technology (IT) hardware, and installing energy efficient technology. We have estimated that the GGCs will save 516.6 GWh of energy by 2020. Only forecast savings for the Greening Government Commitments within the scope and timeframe of Article 5 (i.e. from 1 January 2014) have been included in the forecast of savings for the alternative approach.

Northern Ireland

An **Energy Efficiency Plan for the Office Estate**, covering the three year period 2011/2014, is expected to achieve a targeted 10% energy savings against the baseline year of 2010/2011. That Plan focused on 3 main areas: reduction in the footprint of the estate; capital investments in energy efficiency; and behavioural change in staff occupying buildings.

A new three year Plan is being developed to cover the period 2014/2017. This will build on the success of the earlier Plan and will contribute to the achievement of the UK target.

Scotland

In its **Carbon Management Plan**, the Scottish Government committed itself to reducing CO_2 emissions by 30% by 2020 from a 2009/10 baseline. Under the Climate Change (Scotland) Act 2009, all Scottish public bodies are required to contribute to carbon emissions reduction targets; contribute to climate change adaptation; and to act sustainably. The Carbon Management Plan identifies several measures to reduce energy, waste, water, transport and business travel emissions. The Scottish Government is working closely with key stakeholders and facilities management contractors to develop and implement a Behaviour Change Campaign to raise staff awareness of resource efficiency issues in the workplace.

The Government estimates that the Carbon Management Plan will save 27.5 GWh of energy by 2020. Only savings from 1 January 2014 have been included.

Wales

The Welsh Government's **Climate Change Strategy** aims to cut emissions from the Welsh Government administrative estate by at least 30% in 2019/20 from a 2010/11 baseline. Achievement across the Welsh Administrative Estate in the first 2 years amounts to a reduction of 17%. The Government estimates that the Strategy will save 3.4 GWh of energy. Again only savings from 1 January 2014 have been included.

Total energy savings

When an estimate for estate rationalisation (106 GWh) is deducted from the savings figures above, the overall estimated saving to 2020 is **441.5 GWh**. This indicates that the UK is on course to exceed considerably the savings target of 163.6 GWh. However, we shall monitor savings carefully on a yearly basis.

3.2 Buildings of other public bodies

The exemplary role of public bodies

As well as taking action to reduce energy consumption on our central government estate, the wider public sector must also lead by example. Many public bodies in the UK at both national and local level already have stretching plans in place to reduce the energy consumption of their buildings. Other measures such as the Salix Finance interest free loan scheme to public bodies for energy efficiency measures, support the installation of cost effective energy efficiency measures.

There are a number of existing initiatives which encourage English and UK-wide public bodies to develop energy efficiency plans, including:

- The Committee on Climate Change Guidance to local authorities (commissioned by Government), *How local authorities can reduce emissions and manage climate risks,* details how to produce an energy efficiency plan and the energy saving and efficiency objectives and actions that a plan could contain.
- The Local Government Association's *Climate Local* voluntary initiative, which encourages the setting of targets and reporting against these for local authorities.
- The Department of Energy and Climate Change (DECC) guidance *A Guide to financing energy efficiency in the public sector* includes an overview of energy management, Energy Service Companies and Energy Performance Contracting, and examples of existing best practice in the public sector. This is being updated.
- RE:FIT is an Energy Performance Contract for the public sector which uses an Energy Service Company (ESCO) to implement energy efficiency measures. DECC requires Local Partnerships, the organisation which operates the scheme, to encourage the public sector organisations it works with to implement energy management plans.

In addition, we plan to encourage public bodies to develop energy efficiency plans, put in place energy management systems (including energy audits), and use energy services contracts and energy performance contracting through a combination of the following measures: promotional activity, including the publication of guidance; stakeholder workshops; other methods of awareness raising; and the provision of a model energy performance contract and information on best practice for energy performance contracting.

It is not yet possible to report on all the public bodies which have developed energy efficiency plans as the requirement comes into effect on 5 June 2014. It should be possible to report on this in the next NEEAP.

3.3 Purchasing by public bodies

In 2011 to 2012, central Government procured goods and services from 220,000 suppliers to the value of £44 billion[51] giving it unparalleled buying power in the UK. Clearly Government action in this area has the capacity to help drive market transformation towards energy efficient products, buildings and services. This is why the UK has introduced a number of sustainable procurement commitments.

Existing Government Commitments

As part of the Government's ambition to be the "greenest government ever", the Department for Environment, Food and Rural Affairs (DEFRA) published an Action Plan[52] for driving sustainable operations and procurement across Government in November 2010. In order to implement this Action Plan, the Government introduced the Greening Government Commitments (GGCs) in 2011. The GGCs replaced the Sustainable Operations on the Government Estate targets which had already driven significant improvements in energy efficiency across Government.

The GGC sustainable procurement commitment states that government will buy more sustainable and efficient products, by embedding the Government Buying Standards in departmental and centralised procurement contracts, and that it will engage with its suppliers to understand and reduce the impacts of its supply chain. The Government Buying Standards build on the EU Green Public Procurement criteria and include criteria that relate to energy efficiency.

In addition to the Greening Government Commitments, in March 2011 DEFRA published revised guidance for the Flexible Framework for sustainable procurement. The Flexible Framework is a voluntary self-assessment tool to help organisations monitor and measure their progress on sustainable procurement. The revisions incorporate the Greening Government Commitments into the framework. The guidance states that if organisations that are bound by the Commitments choose not to use the Flexible Framework to report progress, they are expected to report progress in another format.

Sustainable procurement in the future

The Government will build upon its successful sustainable procurement framework to ensure that the requirements of Article 6 are met. Central Government departments will be given clear notification of the legal obligations placed upon them by Article 6. The Government maintains webpages on sustainable procurement[53] which will explain the requirements of Article 6 and highlight the benefits of energy efficient procurement.

The Government plans to ensure the requirements of Article 6 to purchase buildings with high energy efficiency are met by producing a schedule of Maximum Energy Performance Ratings for different building types which accord with the minimum standards required in Article 5(1) of the Directive. New buildings are subject to building regulations and will therefore comply with the minimum energy performance requirements under Article 5(1) of the Energy Efficiency Directive.

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[51] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220623/pesa_complete_2012.pdf. (This figure excludes expenditure through the National Health Service).

[52] http://sd.defra.gov.uk/documents/ap-driving-sustain-ops.pdf

[53] http://sd.defra.gov.uk/advice/public/

The UK government plans to encourage public bodies to use energy performance contracts by provision of a model energy performance contract and information on best practice for energy performance contracting.

Capability often determines whether operational costs, like energy efficiency, are taken into account in procurement decisions. In order to ensure that departments have the necessary capability, DEFRA maintains a set of sustainable procurement training modules. These can be delivered online or Authorities can commission face-to-face training sessions using ready-made modules. These modules will be updated to reflect the Article 6 requirements.

The progress of departments will be assessed at a DEFRA Project Board. This Board will bring together key departments to ensure that action is being taken to meet the requirements of Article 6. In addition, it will give departments an opportunity to discuss their experiences. The sharing of best practice will also be facilitated through the Greening Government Practitioners Forum and a new web-based interactive initiative: Sustainability in Government, the Webinar Series for Sustainability Practitioners.[54]

Northern Ireland

The Department of Finance and Personnel's Procurement Directorate (CPD) will ensure that NI departments are given clear notification of the legal obligations placed on them by Article 6 of the Energy Efficiency Directive. This may include procurement guidance which would supplement any UK wide guidance with NI specific guidance if necessary.

The NI Centres of Procurement Expertise (CoPEs), through the Construction Industry Forum for Northern Ireland (CIFNI) sustainability requirements and the Government Construction Clients Sustainability Action Plan, will set energy and carbon efficiency targets for central government building projects.

CPD will engage with the other NI CoPEs to access model contracts for energy performance contracting for public sector organisations.

[54] http://www.4allofus.org.uk/sustainable-practioners-forum-webinars/

4. Other End Use Energy Efficiency Measures

4.1 Industry

Over the last twelve months the Government has taken action to ensure that UK businesses have access to the support and information they need to install cost-effective energy efficiency measures. This has helped businesses cut costs and improve their bottom line whilst becoming more energy efficient. For example, Industrial energy consumption is projected to fall by 12% over the next two decades due to opportunities in Combined Heat and Power (CHP) and process, energy and material efficiency.[55]

Policies promoting energy efficiency in Industry

The EU Emissions Trading System puts a price on greenhouse gas emissions and places a cap on emissions from electricity generation and the most energy-intensive industries. The aim is to reduce emissions through financial incentives on business and consumers to drive take up of least cost abatement. It covers about 900 UK installations representing about half of UK CO_2 emissions. The emissions trading approach allows emissions reductions to occur where most cost-effective in the sectors covered by the cap.[56]

Box 1 in the "Energy Audits" section of the NEEAP provides details of the Climate Change Agreements, CRC Energy Efficiency Scheme and Mandatory GHG Reporting Scheme which all drive improvements in industrial energy efficiency.

Further Action

The Government believes the existing package of measures remains an effective way to tackle the barriers to energy efficiency take up amongst business and industry; but we will review the CRC Scheme and the CCA targets in 2016, once the recent changes to both schemes have had time to take effect and the benefits realised. To maximise synergies in the policy landscape the Government will also conduct an initial review of the effectiveness of the Energy Savings Opportunity Scheme in 2016, following the first phase which concludes in December 2015.

We recognise that there is more the Government can do to help businesses beyond introducing measures that reduce the costs of energy bills. Since the publication of the *Energy Efficiency Strategy* we have taken action to reduce the regulatory burden on businesses, by simplifying existing business energy efficiency policies. We will continue to look for opportunities to introduce new policies to help businesses manage costs and take up cost-effective energy efficiency measures, and we will look do so in a way that seeks to minimise regulatory burden.

4.2 Transport

The transport sector has a key role to play in improving UK energy efficiency. Already, as a result of Government action, the transport sector is seeing increasing take up of energy efficiency measures; the efficiency of new cars in the UK improved by 27% between 2002 and 2012,[57] allowing new car owners in 2012 to drive, on average, 14 miles per gallon more than new car owners in 2002. Regulations in place since 2009 requiring the automotive industry to produce more efficient vehicles have ensured that a car sold today (2013) uses much less fuel, equivalent, on average, to a saving of 15 pence per litre. By 2020 this will increase to around 42 pence per litre.

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[55] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48574/4805-future-heating-strategic-framework.pdf

[56] https://www.gov.uk/government/policies/reducing-the-uk-s-greenhouse-gas-emissions-by-80-by-2050/supporting-pages/eu-emissions-trading-system-eu-ets

[57] https://www.gov.uk/government/publications/new-car-carbon-dioxide-emissions

Ultra-Low Emissions Vehicles

The Government wants to see continued progress in the transport sector and that is why we recently announced a long-term, comprehensive package of support for the Ultra-Low Emissions Vehicle (ULEV) sector. The 2013 Spending Round announced £500m to support the development of the ULEV market from 2015-2020, which builds on the £400m committed by the Coalition to the end of the current Parliament. It is the Government's aspiration that by 2050 almost every car and van in the UK will be an ULEV.

There has been significant progress in the last twelve months. In February 2013 the Government announced a £37m package of measures including grants for the installation of home, on-street and train station charging points. Additionally, the uptake of ultra-low emission cars is promoted through the provision of consumer grants. As of 31 December 2013, 6709 claims had been made through the Plug-in Car Grant scheme and 404 claims have been made through the Plug-in Van Grant scheme.[58]

Eco-driving

Eco-driving is driving that uses fuel efficient driving techniques, and it is included in the practical car driving test. The Driver and Vehicle Standards Agency (DVSA) National Standard for driving cars and light vans includes a section specifically about driving in a fuel-efficient, responsible way and the DVSA National Standard for driver and rider training sets an expectation that Approved Driving Instructors will be able to teach those skills effectively.

The Government has provided grant funding to the Energy Saving Trust (EST) since 2009 to support them in delivering eco-driving lessons to business vehicle fleet drivers. To date the EST has trained over 32,000 drivers. The Government is also working to ensure that there is publicly available information on the potential financial and environmental benefits of eco-driving to encourage motorists to use the techniques. Accordingly, Government has funded the EST to undertake field trials that will provide eco-driving training to 500 drivers, followed by on-going evaluation of the fuel savings they achieve while driving.

Public Transport

The Green Bus Fund aims to cut greenhouse gas emission levels and encourage bus operators and local councils to make the switch to greener and quieter buses including hybrid, electric and biomethane gas buses. In total, 4 rounds of the Fund (worth £89 million) will have part-financed around 1,250 new low carbon buses in England. Every low carbon bus emits at least 30% fewer greenhouse gas emissions than a comparable diesel bus, meaning that the Green Bus Fund fleet will save more than 28,000 tonnes of CO_2 emissions per year which equates to 404,073 GJ energy savings.

In rail transport, further electrification of the network will bring energy efficiency benefits as well as reducing rail journey times, operating costs and dependency on fossil fuels. The Government is committed to electrification of large parts of the existing network infrastructure and set out plans for further electrification in *High Level Output Specification 2012.*[59] The rail industry also published in 2012 its *Rail Technical Strategy*[60] and this covered reduced reliance on fossil fuels, low embedded carbon materials, energy efficient operations and information on how energy is used.

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[58] https://www.gov.uk/government/publications/plug-in-car-grant

[59] Plan of Rail High level output specification(HLOS) 2012 electrification by 2019 -https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3647/map-hlos-electrification.pdf

[60] http://www.futurerailway.org/RTS/About/Documents/RTS%202012%20The%20Future%20Railway.pdf

Freight Transport

The freight transport industry is taking steps to increase its fuel efficiency. For instance, operators in the Freight Transport Association Logistics Carbon Reduction Scheme[61] are taking various steps to reduce their fuel consumption and carbon emissions through: driver training and performance monitoring; reduced empty running; improved routeing and scheduling; and greater use of aerodynamic devices and low rolling resistance tyres to reduce drag and more efficient engines,. Members of the Scheme have committed to a collective reduction of 8% in the carbon intensity of their freight operations by 2015 against a 2010 baseline.

Shipping

There remains considerable potential for energy efficiency improvements and emissions reductions in the shipping sector. The Government is committed to addressing greenhouse gas emissions from ships by developing and adopting measures at the International Maritime Organization (IMO).

[61] Details on Logistics Carbon Reduction Scheme (LCRS) can be found at: http://www.fta.co.uk/policy_and_compliance/environment/logistics_carbon_reduction_scheme/

5. Promotion of Efficient Heating and Cooling

Heating accounts for around a third of UK greenhouse gas emissions. We are changing the way we produce, distribute and consume heat in order to meet the requirements of this Directive and our longer-term climate change targets.

The most energy-efficient way to use any fuel is to convert it into power and heat simultaneously. Provided there is a demand for both, cogeneration (or combined heat and power (CHP) as it is known in the UK) can deliver energy and carbon savings of up to 30% by reducing energy lost as waste heat, compared to separate power and heat generation from the same fuel. Most UK CHP capacity is industrial, supplying process steam. A smaller, but expanding, proportion of heat supplied by CHP is in the form of 'Low Temperature Hot Water' for space and water heating. This includes heat provided via heat networks.

Whilst many heat intensive industries are already close to maximising their energy efficiency, evidence shows that a range of cost-effective opportunities remain available. The UK's policies are designed to realise this potential, including energy efficiency, switching to lower carbon fuels, industrial carbon capture and storage (CCS) and CHP. As shown below, the Government, in conjunction with the Devolved Administrations, is taking a range of steps to address the barriers facing growth in renewable and natural gas CHP capacity, and to encourage the development of heating and cooling networks.

The National Comprehensive Assessment

Article 14 requires Member States to carry out a comprehensive assessment of the potential for the application of high-efficiency cogeneration and effective district heating and cooling by 31 December 2015. This assessment must include a cost-benefit analysis based on climate conditions, economic feasibility and technical suitability. The obligation to complete this assessment is being transposed into UK law via an implementing statutory instrument.

Box 4: Methodology for the National Comprehensive Assessment

The UK Government will produce the comprehensive assessment on behalf of England, Wales and Northern Ireland. The Scottish Government will produce the assessment for Scotland. Both assessments will include the information set out in Annex VIII of the Energy Efficiency Directive. The methodology has not yet been decided nor have the assumptions been defined, but the UK will be able to build upon a significant body of existing research, including:

- Projections of technical potential and economically viable CHP capacity and use;[1]
- DECC's modelling using the Energy Technology Institute's Energy System Modelling Environment (ESME) to look at sensitivities on the engineering system designs for pathways to decarbonising heat to 2050, characterising optimal outcomes at the energy system, sector and individual technology levels;
- The CHP Development map[2] which maps heat demand and thermal power plants to support the development of CHP in the UK;
- The heat map[3] developed by DECC and the Centre for Sustainable Energy;
- The heat map for Scotland and work carried out for the draft Heat Generation Policy Statement.

The country-level cost-benefit analysis for England, Wales and Northern Ireland will be carried out by DECC and the analysis for Scotland will be carried out by the Scottish Government. Both analyses will adhere to Annex IX Part 1 of the Directive. These analyses will facilitate the identification of the most resource and cost-efficient solutions to meeting heating and cooling needs in the territory, and will provide a decision base for qualified prioritisation of limited resources at society level. They will include an economic analysis covering socio-economic and environmental factors. The Statutory Instrument mentioned above will require national authorities to undertake a cost-benefit analysis of the potential for high-efficiency cogeneration within their territory.

Several of the elements of the country-level cost benefit analysis have already been completed by DECC. The outstanding actions will be completed by December 2015. The methodology has not been chosen, but it will be based on current demand/supply mapping, data gathering, and modelling techniques, including utilising the National Heat and CHP Development Maps, and referring to 2013 Updated Energy & Emissions Projections for CHP uptake, DUKES and Energy Trends data sets, and UK and EU standardised assumptions.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191543/Projections_of_CHP_capacity___use_to_2030_2204.pdf

[2] http://chp.decc.gov.uk/developmentmap/

[3] http://tools.decc.gov.uk/nationalheatmap/

Installation-level Assessments

Article 14(5) requires operators of individual installations[62] to carry out a cost-benefit analysis to assess the potential for operating as high-efficiency cogeneration, connecting to a heat network or utilising waste heat from a nearby industrial installation. Installations must demonstrate that a cost-benefit analysis has been carried out and that the results of that cost-benefit analysis have been taken into account and acted upon accordingly. Where cost effective and technically

[62] With a thermal input exceeding 20 MW

feasible opportunities are identified, national authorities will be required to authorise only installations developed as co-generation or using waste heat recovery. If an operator chooses not to take such actions then they will be unlikely to be granted a permit to operate, except for in exceptional circumstances where a strong case can be made to justify non-compliance with the cost-effective option.

The Environmental Permitting Regulations apply to England and Wales. The Pollution Prevention and Control Regulations apply to Scotland and Northern Ireland. Both of these sets of regulations are being amended to reflect the requirements contained in Article 14(5).

Article 14(6) exempts certain types of installation from Article 14(5) and allows Member States to develop thresholds below which an installation is exempt from the requirement to conduct a cost-benefit analysis. The UK plans to implement the exemptions contained in this subsection, and submitted its exemption thresholds to the Commission on 17 December 2013.

Developing the economic potential of high-efficiency cogeneration and efficient heating and cooling

The Government is undertaking work to improve our evidence base on district heating networks. DECC has committed funding to two complementary policies to support local authorities in England and Wales through the process of developing heat networks. £10m, spent over the two financial years 13/14 and 14/15, has been committed to a Heat Networks Delivery Unit (HNDU) which was established in September 2013, and has already run two rounds of funding to Local Authorities. Three more rounds are planned for the coming year. In addition to the funding stream worth £7m, it is also providing specialist expertise that many Local Authorities do not have in-house.

In March 2013, DECC published *The Future of Heating: Meeting the challenge.*[63] This document identified significant potential for additional natural gas CHP capacity, and significant carbon savings provided this displaced higher carbon intensity generation. The publication concluded that there were two main barriers to growth in natural gas fired CHP capacity: energy savings and revenue from electricity sales not being sufficient to meet rates of return required to secure finance, which are higher than those required for power-only projects in the utilities sector; and access to the electricity wholesale price for smaller generators.

For these reasons, DECC committed to developing a bespoke policy to support new natural gas CHP capacity, subject to confirmation that additional capacity would not displace lower carbon electricity generation. In the interim, DECC is working with The Department of Business, Innovation & Skills (BIS) to explore opportunities to support new good quality natural gas CHP capacity, via existing Government funding streams such as the EU Structural and Investment Funds.

DECC has also recently held interactive workshops across England to publicise the economic and environmental benefits of installing CHP technology and/or district heating networks. The workshops were targeting audiences from Local Authorities, universities and hospitals.

Estimates for recoverable 'waste' heat from industry vary. In March 2014, we published *The potential for recovering and using surplus heat from industry* which concludes research to assess the technical and economic potential for recovered heat as a low carbon energy source. Based on this research, the Government will explore the scope for incentivising recovered 'waste' heat.

[63] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48574/4805-future-heating-strategic-framework.pdf

Box 5: Existing support for CHP

The **CHP Focus programme** supports potential developers of all forms of CHP by provision of information on the benefits of CHP and tools to support assessments of the viability of CHP projects.

Under the **Environmental Permitting Regulations**, developers are already required to consider CHP (as a Best Available Technique for energy efficiency) and assess the cost-benefit of CHP opportunities when seeking a permit to operate power plant and industrial installations. Where there are no economic heat supply opportunities at the time of permitting, applicants are required to develop the plant as 'CHP-ready' unless they can demonstrate that this is not cost-effective.

A range of financial incentives is available to CHP operators. The **CHP Quality Assurance programme** ensures that only 'Good Quality' schemes, i.e. those delivering genuine energy savings, are eligible for preferential treatment under the Climate Change Levy, Carbon Price Floor, Enhanced Capital Allowance, Business Rates and the Renewables Obligation.

The **Carbon Price Floor** (CPF) ensures a minimum carbon price for emissions from electricity generation, following a straight-line trajectory to £30/tonne (2009 prices) by 2020. To ensure CHP is on a level playing field with other heat sources, emissions associated with heat from CHP will not be liable for Carbon Price Support (CPS) rates. Use of a boiler substitution method for exempting heat means that carbon savings from CHP are valued at the full CPF price. In addition generators up to 2 MWe capacity are not liable to CPS rates, which excludes approximately 80% of CHP schemes from CPS rates. Budget 2014 announced that good quality CHP will be exempt from Carbon Price Support costs from 2015/16 in respect of electricity generated for on-site consumption; fuel used to generate electricity for export will be still be liable for CPS rates.

Under the **CRC Energy Efficiency Scheme**, gas used in CHP installations is exempt from CRC allowance costs. CHP is only liable for CRC costs in respect of electricity produced and consumed on-site. From 1 April 2014, input fuels for CHP are treated as out of scope for the CRC Energy Efficiency Scheme, meaning that no allowances need to be purchased in respect of this fuel. This change was made to support CHP as an energy efficient process that captures and utilises the heat that is a by-product of the electricity generation process.

The **Enhanced Capital Allowance** (ECA) scheme was introduced in 2001 to increase the take up of energy efficient equipment by industry. It allows businesses to claim 100% tax relief on qualifying energy efficiency expenditure in the tax year. There are approximately 19,000 qualifying products on the Energy Technology List (ETL). This includes Good Quality CHP.

Good Quality CHP schemes are eligible for **preferential business rates**.

Under the **Renewables Obligation** some types of renewable CHP (including Energy from Waste) are eligible for a higher level of support per MWh electrical output than power-only plant. In general, renewable CHP schemes accredited up until 31 March 2015 are eligible to apply for this support. Biomass CHP is also exempt from the cap on new build biomass power plant capacity.

Other measures addressing efficient heating and cooling

Building Regulations have been amended to include recast EPBD requirements that an analysis of high efficiency alternative systems (including decentralised energy supply systems, district heating or cooling based on energy from renewable sources, cogeneration and heat pumps) is carried out before construction commences.

Northern Ireland

The Department of Enterprise, Trade and Investment (DETI) has responsibility for delivering a level of 10% renewable heat in Northern Ireland by 2020. The Northern Ireland Renewable Heat Incentive (RHI) which is currently open to non-domestic installations, has been in place since 1 November 2012 and provides long term financial support for those wishing to switch from conventional heating to renewable heating solutions. Currently domestic renewable heat installations are supported through the Renewable Heat Premium Payment (RHPP) scheme which provides grant support towards the cost of certain renewable technologies.

In addition, DETI has consulted on proposals to expand the current RHI scheme to include more innovative technologies and extend the scheme to the domestic market. It is anticipated that some changes to the scheme will therefore be introduced in spring 2014. These proposals included the potential introduction of an 'uplift' tariff for renewable district heating schemes.

Scotland

Establishing a strategic approach to the decarbonisation of heat is a priority for the Scottish Government. Scotland's *Outline Heat Vision* was published on 29 January 2013; this document set out Scotland's ambition to have a largely decarbonised heat sector by 2050.

Following a pilot projects with Local Authorities, the Scottish Government is carrying out a Heat Mapping Programme for Scotland and plans to publish the national heat map by summer 2014.

The expansion of district heating is at the heart of Scotalnd's intentions to strengthen the impact of energy efficiency across our built environment. The Scottish Government published its *District Heating Action Plan* in May 2013. One of the priorities in the Action Plan was to set up the Heat Network Partnership[64] to provide support to district heating projects at all stages from planning to procurement and implementation.

The Scottish Government published its draft Heat Generation Policy Statement for consultation on 4 March 2014, which includes the following targets for district heating:

- an overarching target of 1.5 TWh of heat to be delivered to households, business and industry and the public sector by district heating by 2020;
- a target of 40,000 homes to be supplied with affordable low carbon heat through district heating and communal heating by 2020.

The Scottish Government has increased its funding by over £4 million for the District Heating Loan Fund, making a total of £8 million available over the next 2 years. This is part of a £10.5 million package of support for heat policy over the next 2 years. The £103 million Renewable Energy Investment Fund (REIF) and the £50 million Warm Homes Fund include district heating in their priority areas.

The £7.3 million Resource Efficient Scotland programme will develop strategic interventions that build capacity and increase knowledge to accelerate towards a fully decarbonised heat sector, including supporting Scottish based industries to develop individual sector 'roadmaps'.

[64] www.districtheatingscotland.com

6. Energy Transformation, Transmission, Distribution and Demand Response

Electricity and gas networks play a key role in the achievement of sustainable development. The Government therefore places importance on incorporating energy efficiency in network design and operation, and promoting demand side response. The following paragraphs describe some of the main measures being taken to bring this about.

Energy efficiency criteria in network tariffs and regulation in Great Britain

Regulatory framework

In line with Article 15(1) of the Directive, the regulatory framework for Great Britain (GB) is designed to ensure that the appropriate incentives exist for electricity and gas network companies to pursue the most cost-effective delivery of their goals by adopting best practice energy efficiency measures.

For example, Ofgem's RIIO (Revenue = Incentives + Innovation + Outputs) regulatory price control framework sets conditions up front for an eight year period that encourages efficient delivery of a comprehensive set of outputs. These include minimising the environmental impact of the network company activities including where applicable through managing system losses. Network companies are encouraged both through their core business and via an extra innovation stimulus package to consider new ways of delivery and to work with others including on energy efficient developments. In GB, the structure of network tariffs encourages network users to avoid usage at times of peak demand. In addition, there is a locational element to tariffs to ensure they reflect costs imposed by users at different points in the network.

Box 6: Key regulatory provisions

Section 3A(1A) of the Electricity Act 1989 – Ofgem, the regulatory authority for GB, must have regard to the need to contribute to the achievement of sustainable development.

Section 3A(5) of the Electricity Act 1989 – Ofgem must carry out its functions in the manner which it considers is best calculated to promote the efficient use of electricity conveyed by distribution systems or transmission systems.

Section 4AA(5) of the Gas Act 1986 – Ofgem is required to carry out its functions in a manner which it considers is best calculated to promote efficiency and economy in relation to the gas network.

Section 33BC of the Gas Act 1986 – the Secretary of State may order gas transporters and suppliers to comply with energy efficiency targets set by Ofgem.

Section 3B(4) of the Electricity Act 1989 and Section 4AB of the Gas Act 1986 – Ofgem must have regard to guidance issued by the Secretary of State. This guidance is called the Social and Environmental Guidance to the Gas and Electricity Market Authority and contains an energy efficiency component. Under measures contained in the Energy Act 2013, this Guidance will be replaced with a new Strategy and Policy Statement for Ofgem.

Network tariffs

The Government recognises the important role that network tariffs can play in incentivising energy efficiency. In accordance with Article 15(4), transmission and distribution tariffs in GB are not detrimental to overall efficiency or the participation of demand response in relevant markets. For electricity and gas, network companies are required through licence conditions

to ensure that transmission and distribution tariffs in GB are cost reflective as far as reasonably practicable, non-discriminatory and designed to drive the overall efficiency of the system.

Incentivising efficiency improvements through infrastructure design and operation

Electricity and gas network operators are incentivised to improve efficiency in infrastructure design and operation through Ofgem's RIIO price control framework, and this meets the relevant requirement in Article 15(4). These provisions are implemented through specific licence conditions in the network operators' licences.

For example, on the gas distribution side, Ofgem set target reductions in gas transport losses of between 15 to 20% over the price control period. On electricity, the RIIO process placed a requirement on National Grid to publish a strategy for the Transmission Price Control Period (2013-2021) setting out how it intends to minimise the level of electricity transmission losses, and to publish an annual report on progress in implementing the strategy.

In addition, these obligations are supported by a condition in electricity and gas transmission licences, as well as gas distribution licences, which has established an innovation stimulus package. This package includes an allowance to support innovation and an Innovation Roll out Mechanism enabling network companies to apply for additional funding within the price control period for the rollout of initiatives including those with demonstrable and cost effective low carbon and environmental benefits. The same structure will apply to Electricity Distribution Network Operators (DNOs) for the 2015-23 Distribution Price Control Period, and will include a new licence obligation on DNOs to 'reduce losses to as low as reasonably practical'. Until 2015, DNOs will continue to seek funding to develop and demonstrate new technologies, operating and commercial arrangements through the Low Carbon Networks Fund.

Network tariffs and consumer participation

For both electricity and gas, there are no provisions contained within the use of system tariffs for electricity transmission and distribution that prevent suppliers from improving consumer participation in achieving sustainable development objectives. This is consistent with the requirements of Article 15(4).

Northern Ireland

Regulatory framework

The duties of the Northern Ireland Authority for Utility Regulation (NIAUR) in respect of both electricity and gas are set out in the Energy (Northern Ireland) Order 2003. For electricity NIAUR is required to ensure the development of secure, reliable and efficient non-discriminatory systems that are consumer orientated as well as promoting system adequacy and, in line with general economic policy, energy efficiency. They are also required to promote the efficient use of electricity and efficiency and economy on the part of persons authorised by licences or exemption. Northern Ireland intends to amend the Energy Order through secondary legislation to widen the duties of the Authority in relation to energy efficiency and electricity.

For gas the Energy Order sets out that the principal objective of the Department and NIAUR in carrying out their respective gas functions is to promote the development and maintenance of an efficient, economic and co-ordinated gas industry in Northern Ireland. The Department and NIAUR are also required to carry out their respective gas functions in the manner which it considers is best calculated to promote the efficient use of gas or to secure a diverse, viable and environmentally sustainable long-term energy supply.

Network tariffs

The NIAUR has reviewed the relevant tariffs and has not identified any tariffs that are detrimental to overall efficiency. This is underpinned by licence conditions on the Distribution and Transmission System Operators not to act in a discriminatory fashion.

DETI is working with NIAUR, and has met with representatives from the Transmission and Distribution System Operators regarding appropriate incentives for the improvement of the system through infrastructure design and operation. DETI recently consulted on proposals for the transposition of Article 15 in Northern Ireland, including network tariffs, and will transpose the requirements of Article 15 through secondary legislation where appropriate.

Incentivising efficiency improvements through infrastructure design and operation

While there are no specific incentives in relation to energy efficiency, both Distribution Use of System and Transmission Use of System tariffs are structured on a reflective basis to consider network costs. This creates incentives for consumers to consider their usage profile and reduce their consumption during peak usage periods. Transmission System Operator tariffs are based on the obligation to design the transmission system so as to develop, maintain and operate an efficient, co-ordinated and economical system for the transmission of electricity in Northern Ireland. Network tariffs are set mainly with reference to price controls which include incentives to improve efficiency of running the networks.

Facilitation and promotion of demand side response in Great Britain

Electricity

GB already has a number of measures which enable and develop demand response and fulfil the relevant requirements of Articles 15(4) and 15(8).

The cost reflective nature of GB network tariffs facilitates demand side response (DSR) and dynamic pricing. For example, the underlying rationale for those charges (which are designed to recover the costs incurred by Transmission Owners in providing and maintaining the transmission network) is that efficient economic signals are provided to users of the system. Therefore, charges reflect the impact that users of the transmission system at different locations have on the Transmission Owners' costs, if they were to increase or decrease their use of the respective systems. In addition, the element of the charge paid by suppliers is structured to encourage reduced usage at times of peak demand, (i.e. to lower the costs, both investment and operation based, of electricity transmission) thereby supporting demand-side measures.

Whilst not locational, the charges which cover the day-to-day operation of the system (known as Balancing Services Use of System, or BSUoS, charges) are also cost reflective in the sense that they are designed to recover the costs incurred by the System Operator when buying or selling electricity and other services to keep the electricity transmission system in balance. The cost to be collected via the BSUoS charge is split equally between generators and suppliers across GB. The individual charge payable is based on actual metered volumes of energy supplied to or taken from the system. This means that the charge for suppliers is relatively lower in periods where their demand is lower. This makes offering products which incentivise decreased consumption at peak times and increased consumption at non-peak times attractive to suppliers.

Ofgem will have oversight of the forthcoming Capacity Market, which will incentivise sufficient reliable capacity (both supply and demand side) to ensure a secure electricity supply even at times of peak demand. The Capacity Market will include a programme to grow the size and capability of GB's DSR industry. The proposed charging system for the Capacity Market

will be based on share of customer market demand on winter weekday evenings, with the intention of incentivising suppliers to reduce their demand through demand response and time-of-use tariffs.

The roll out of smart meters across Great Britain in the period to 2020 will support a range of DSR measures. For example, smart meters will record the time when energy is used and provide the necessary two-way communications between consumers and suppliers/other energy market participants, which will help facilitate time-of-use and other sophisticated tariffs. The smart metering communications services have been designed to be sufficiently flexible and scalable to support the increased communications and data flows that are expected to come from DSR measures.

Gas

Ofgem has considered how to maximise DSR from large users as a gas balancing tool as part of their Significant Code Review. Ofgem has examined a number of potential options and decided to take the most cost-effective option forward to further development, to establish its feasibility at a detailed level. This development is now underway by the System Operator National Grid. The mechanism involves paying large consumers if they are able to reduce their demand before an emergency. This is intended to avoid or minimise an emergency and protect consumers that incur high costs when interrupted.

Northern Ireland

There has been considerable work to date in Northern Ireland in relation to demand side measures; however this is not underpinned in legislation. DETI proposes to introduce a provision to allow NIAUR to enter into agreements with consumers, or aggregators of consumers to encourage energy efficiency in line with the requirements of Article 15(8). DETI also proposes to amend Article 12 of the Energy Order to require NIAUR to encourage demand side resources.

System Operator for Northern Ireland's (SONI) Transmission System Operator (TSO) licence includes a non-discrimination clause which includes all parties, including demand response providers and aggregators, in relation to all of SONI's activities as TSO. Northern Ireland Electricity's Distribution System Operator licence conditions are more specific in relation to when NIE must not discriminate. Through these conditions there is a requirement on NIE as Distribution System Operator not to discriminate in relation to the provision of balancing services, however there is not an explicit requirement for non-discrimination in relation to the provision of ancillary services. It is DETI's intention to place a duty on NIAUR through secondary legislation to ensure that licences include non-discrimination conditions in relation to the provision of ancillary services.

Energy Efficiency in network design and regulation in Great Britain

We will transpose the requirements in Article 15(2) through secondary legislation under section 2(2) European Communities Act 1972, by placing a requirement on Ofgem to ensure the assessment is undertaken and that concrete energy efficiency improvements are identified. The secondary legislation will be in force by 5 June 2014. Ofgem's RIIO regulatory price control framework already incentivises energy efficiency improvements in infrastructure design and operation. As part of the RIIO process, a range of information is being collected on the physical characteristics of the networks and improvement measures identified. This will form the basis of the assessment to be undertaken under Article 15(2).

Northern Ireland

DETI intends to transpose the requirements in Article 15(2) through secondary legislation to place a requirement on NIAUR to ensure that the assessment is undertaken and that concrete energy efficiency measures are identified. It is recognised that input will be necessary from both electricity and gas network owners and this will be underpinned in licence conditions. The secondary legislation will come into force by 5 June 2014.

Annexes

Annex A: Energy Efficiency Directive Annual Report

This annex reports the recent trends in energy consumption and the headline statistics for 2012.[1]

Table 1: Headline UK Energy Statistics for 2012

		Data for 2012	Units
(i)	primary energy consumption;	192.9	mtoe (ncv)
(ii)	total final energy consumption;	132.2	mtoe (ncv)
(iii)	final energy consumption by sector		
	— industry	23.8	mtoe (ncv)
	— transport (passenger)[1]	37.1	mtoe (ncv)
	— transport (road freight transport)	13.3	mtoe (ncv)
	— households	40.0	mtoe (ncv)
	— services	17.2	mtoe (ncv)
	— agriculture	0.9	mtoe (ncv)
(iv)	gross value added by sector		
	— industry	337	billion € 2011 prices
	— services	1,160	billion € 2011 prices
(v)	disposable income of households;	1,206	billion € 2011 prices
(vi)	gross domestic product (GDP);	1,775	billion € 2011 prices
(vii)	electricity generation from thermal power generation;	28.8	mtoe (ncv)
(viii)	electricity generation from combined heat and power;	2.0	mtoe (ncv)
(ix)	heat generation from thermal power generation;	4.2	mtoe (ncv)
(x)	heat generation from combined heat and power plants, including industrial waste heat;	4.0	mtoe (ncv)
(xi)	fuel input for thermal power generation;	71.5	mtoe (ncv)
(xii)	passenger kilometres (pkm), if available;	773	billion kms
(xiii)	tonne kilometres (tkm), if available;	222[2]	billion tonne-kms
(xiv)	combined transport kilometres (pkm + tkm), in case (xii) and (xiii) are not available;	n/a	
(xv)	population	64.1	millions

Note: numbers may not sum due to rounding

1 Other information required in the Annual Report can be found within the NEEAP.

2 Includes freight activity for rail, aviation and shipping.

3 Latest tonne-kms are for 2010.

Summary

Overall, energy consumption in the UK is on a downward trend. Primary energy consumption is 12% lower than in 2005 and final energy consumption is 12% lower. Energy consumption is falling in all sectors of the UK economy.

UK temperatures were significantly colder on average in 2012 than in 2011 and this has driven a rise in energy consumption between 2011 and 2012. However, using the UK's National temperature correction methodology, primary energy consumption fell by 1% and final consumption fell by 1%. Final consumption fell in all sectors on a temperature corrected basis except in domestic, where consumption rose by 1% in 2012 but is still 2% lower than in 2010.

Over the last five years, industrial energy intensity has fallen by 15%, domestic energy per capita has fallen by 9% and passenger transport per km has fallen by 9%. There has been no change in energy intensity in the services sector over this period but the UK lost 4% of GVA in 2009 due to the recession that was only recovered in 2012.

Annex B:
Building Renovation Strategy

Contents

Chapter 1: Introduction

This Building Renovation Strategy has been developed in order to fulfil the United Kingdom's obligation under Article 4 of the Energy Efficiency Directive. The Strategy draws upon existing research and policy documents published by the UK Government to provide an overview of the UK's building stock and its energy efficiency performance, and the existing policies that are designed to enhance the performance of the UK's building stock as we transition towards a low carbon economy.

BOX 1: EU Energy Efficiency Directive, Article 4 requirements:

Member States shall establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. This strategy shall encompass:

(a) an overview of the national building stock based, as appropriate, on statistical sampling;

(b) identification of cost-effective approaches to renovations relevant to the building type and climatic zone;

(c) policies and measures to stimulate cost-effective deep renovations of buildings, including staged deep renovations;

(d) a forward-looking perspective to guide investment decisions of individuals, the construction industry and financial institutions;

(e) an evidence-based estimate of expected energy savings and wider benefits.

A first version of the strategy shall be published by 30 April 2014 and updated every three years thereafter and submitted to the Commission as part of the National Energy Efficiency Action Plans.

Chapter 2: Executive summary

The UK's homes and places of work are some of the oldest and more traditionally constructed buildings in Europe. The energy performance of these buildings can vary enormously; from uninsulated homes built in the 19th century to modern flats and business premises that benefit from the latest insulation and heating technology, which help consumers reduce their energy use.

Bringing as many residential and commercial buildings as possible up to a high level of energy performance is a priority for the UK Government. Investment in building renovation is worthwhile for several reasons. First, because better insulated homes and offices benefit from lower energy bills, helping consumers with the cost and also making it more comfortable for the occupiers. Second, because building renovation drives innovation and creates new business opportunities, including a chance for the UK energy efficiency market to develop expertise and technologies that can be exported to overseas markets. And third, because more energy efficient buildings can help us deliver on our energy security and climate change goals.

The UK has a rich tradition in retrofitting buildings, and we have often led the way in Europe on policies that drive building energy efficiency improvements. Since the first building regulations requiring energy efficiency were introduced in 1972 (for new homes) and 1974 (for new non-domestic buildings), successive UK governments have used building regulations to drive energy efficiency improvements and energy savings. The UK was also one of the first EU Member States to introduce a supplier obligation, with the introduction in 1994 of the Efficiency Standards of Performance scheme providing the foundation for today's Energy Company Obligation.

Though many of the easier to treat building measures have been installed, significant untapped potential remains. The prize is huge but there are clearly some challenges that must be overcome before this potential can be realised. A key issue is understanding our building stock and its potential; we estimate that there is over 80 TWh of outstanding cost-effective energy efficiency potential in this sector. However, there is more that we can do to improve the evidence base and our understanding, particularly in the non-domestic sector where the majority of the remaining potential exists.

Our policies are designed to play an important role in driving economic growth, by supporting jobs in the economy, driving cost-effective energy savings, and improving health outcomes. The refurbishment sector has a key role to play in this, as we look to grow the wider energy efficiency market, which already employs around 136,000 people in the UK, is worth more than £18 billion annually, and delivers exports valued at nearly £1.9 billion per year.

But this activity will not just happen as 'business as usual' so the UK government is committed to removing the barriers to investment in energy efficiency and this strategy sets out our plans to ensure continued investment in the renovation of the UK's building stock.

In 2013, the UK Government launched its Energy Efficiency Strategy. The strategy committed the Government to realising the energy efficiency opportunity in the UK economy, and identified the barriers to take-up of energy efficiency measures. The Government's policies, including those which target building renovation, are designed to overcome these.

Through the Green Deal and Energy Company Obligation we are helping households to insulate their homes, while the UK Green Investment Bank is connecting private finance with demand for energy efficiency measures. And in the public sector, Salix and RE:FIT are financing one of the biggest modernisation drives in the public sector's buildings for generations.

UK households and businesses will soon have unrivalled access to home energy management technologies. The introduction of smart meters in households and small businesses will provide consumers with near real-time information on their energy use. The roll out of the domestic Renewable Heat Incentive will help stimulate a transformation in the way we heat our homes. And we will continue to show leadership in Europe: the Government is committed to consulting on the proposed introduction of minimum energy performance standards for buildings in the private rented sector.

Chapter 3: An overview of the United Kingdom's building stock

The UK's building stock varies widely both in age and type. The stock has proved to be extremely adaptable over time as changes to social and employment patterns have shifted the demand for different building uses. Historic industrial building types like wharf buildings and woollen mills have been converted for use as flats, offices, and retail and community premises.

A detailed statistical overview is provided in Annex B(i).

Profile of the domestic building stock

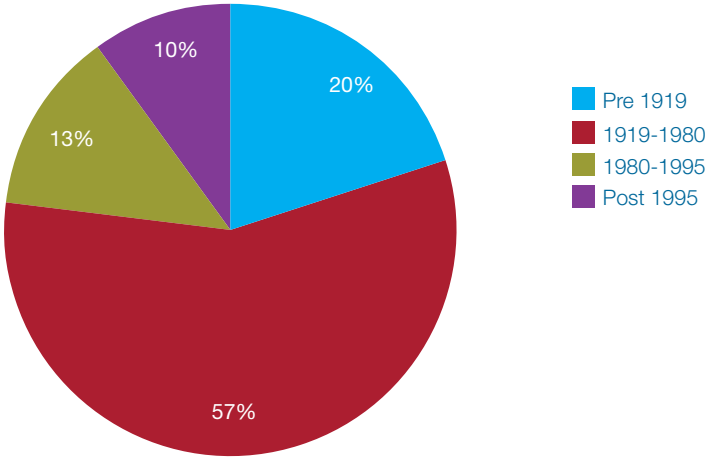
The UK has 27 million homes[1] across a wide range of housing types, including a significant proportion of older buildings, as shown in Figure 1. Collectively these are responsible for 32% of final energy use in the UK.

Over three quarters of the UK's homes were built before 1980 and nearly one fifth are over 100 years old. This means that the majority of the domestic building stock pre-dates the introduction of energy efficiency standards within the national Building Regulations. Based on current construction and demolition rates, over two thirds of the homes that will exist in the UK in 2050 have already been built.[2] This presents both challenges and opportunities for energy efficient renovation.

1 DECC, *United Kingdom housing energy fact file,* 2013.

2 Carbon Trust, *Building the future today*, 2009.

Figure 1: Age profile of UK housing[3]

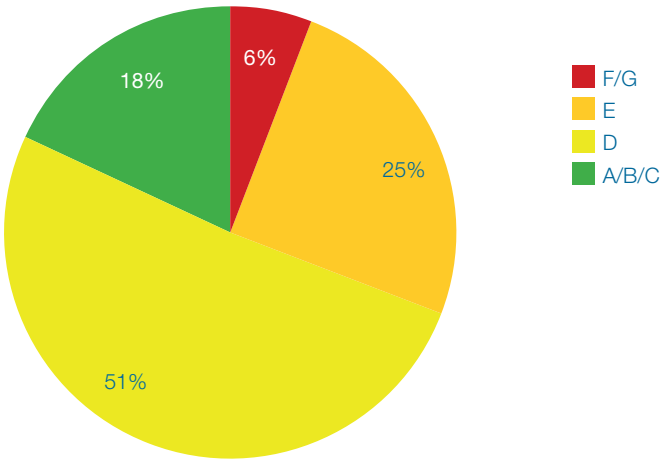


Source: Housing Surveys

The prevalence of older buildings in the national stock built to lower standards of energy efficiency leaves a legacy of non-energy efficient features. Older homes will typically not have insulation, or the they have is of a lower quality than more modern homes. Those older homes which have solid walls face particular challenges in terms of bringing them up to modern standards of insulation.

In England, approximately half the homes have an EPC rating of D, a further 25% band E and 6% of homes are F or G rated. Scotland has a lower proportion of the least efficient housing with 4% rated F or G.

Figure 2: Energy efficiency rating of English housing stock, 2012



Source: English Housing Survey 2012

The UK Government has developed a number of programmes over the last 10-20 years that aim to address the insulation potential in the UK's housing stock. These vary from supplier obligation schemes to voluntary, demand-led programmes like the Green Deal.

[3] Source: English housing survey 2011, Living in wales survey 2008, Northern Ireland Housing Condition Survey 2011 and Scottish House Condition Survey 2009. For Scotland the date ranges are post 1997, 1982-1997, 1919-1981 and Pre 1919.

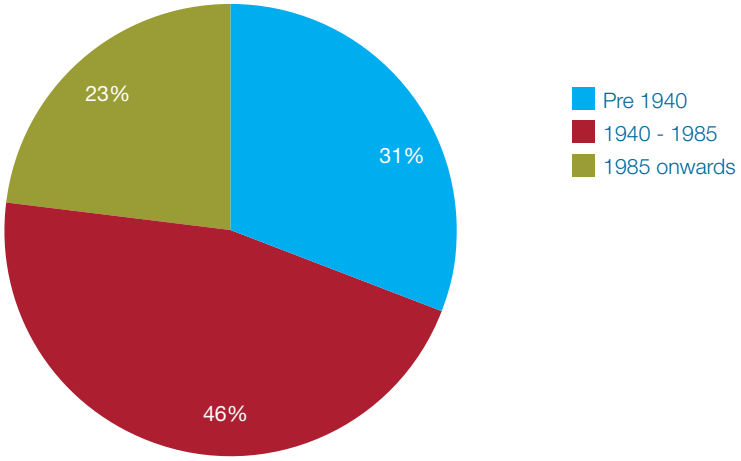
Profile of the non-domestic building stock

There are over 1.8 million non-domestic premises in the UK, which are responsible for around 17% of total UK energy consumption.[4] As with the housing stock, these buildings are made up of many different building types, ages and use profiles; from small shops to high rise commercial office buildings, factories, hospitals and airports.

The non-domestic building stock in the UK also spans a wide range of ages (see Figure 3), with more than three quarters of the stock having been built before 1985 and nearly a third before 1940. Again, most of these buildings pre-date energy conservation measures required under Building Regulations.[5] By 2050, it is expected that half of these buildings will still be in use.[6]

While the share of energy use associated with the building fabric (e.g. heating and ventilation) is slightly lower than in the domestic sector there remains significant potential to reduce consumption through refurbishment.

Figure 3: Age of non-domestic buildings by build period



Source: Building Research Establishment[7]

Energy performance varies widely within the non-domestic sector, even for very similar buildings. It is common to see a five- or tenfold difference in energy intensity per square meter between the lowest and the highest consumption buildings within a particular sub-sector. Part of this variation will be due to differences in the building efficiency

Each energy rating is based on the characteristics of the building itself (the fabric) and its services (such as heating, ventilation and lighting).[8] The data presented in Figure 4 is taken from a national register of EPCs. EPCs are only required under specific circumstances,[9] so this is not fully representative of all building types.

The UK's retail, storage and distribution stock have a higher proportion of better performing

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4 DECC *The Future of Heating: Meeting the Challenge*, March 2013.

5 NOTE: where significant refurbishment has taken place, improvements in the energy efficiency may have been implemented, as required by Building Regulations.

6 Carbon Trust, *Building the future, today*, 2009.

7 Building the Future, Today – Transforming the Economic and Carbon Performance of the Buildings We Work In, Carbon Trust, 2009.

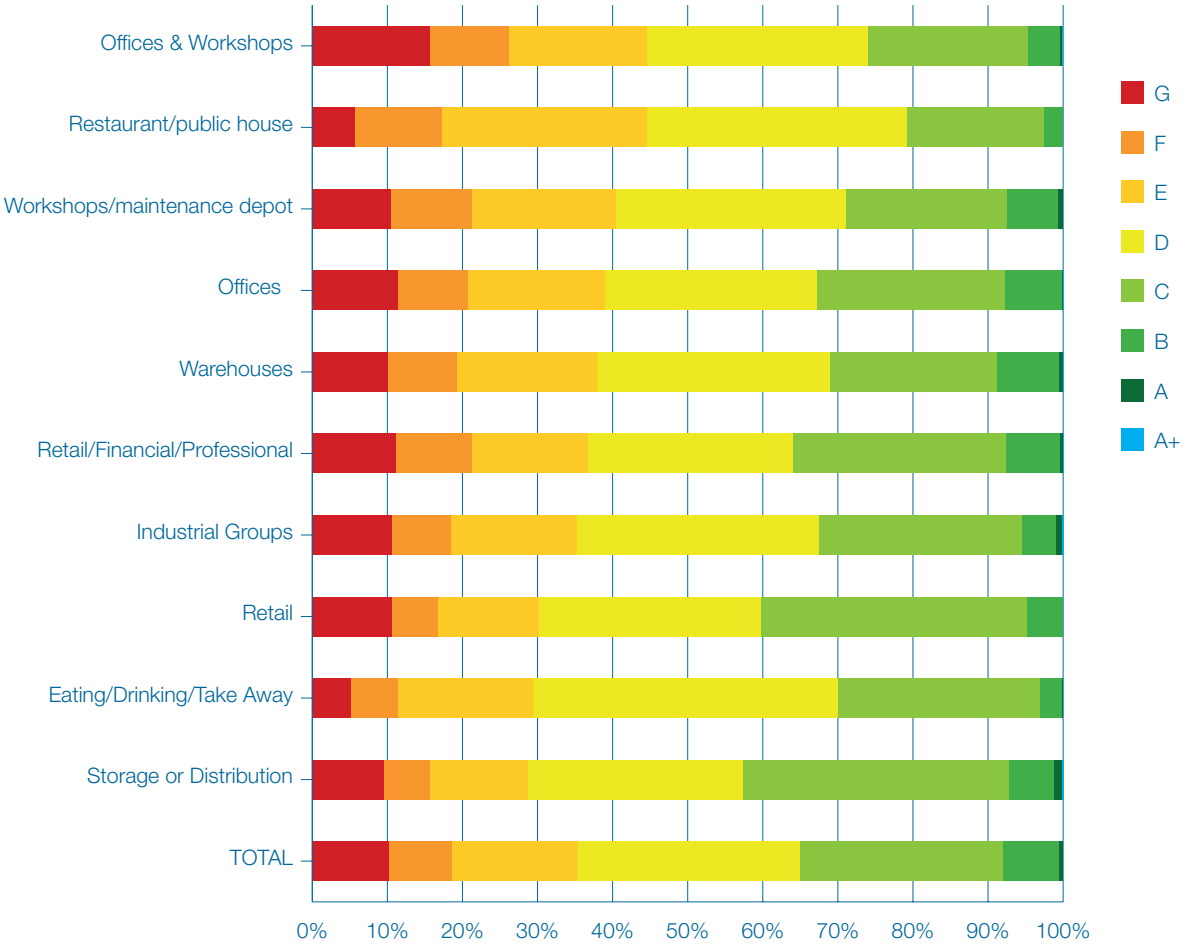
8 NOTE: actual operational energy use may differ as it is affected by actual management, control, usage and unregulated loads.

9 EPCs are required when a premises is rented or sold, when building construction is finished, or when changes are made to the number of parts used for separate occupation and these changes involve providing or extending fixed heating, air conditioning or mechanical ventilation systems.

buildings than average (with the average performance rating for these buildings being a 'D' rating). The reason for the higher energy performance of these buildings can, in large, be attributed to the short term refurbishment cycle of retail buildings, and because storage and distribution buildings are commonly simple structures which are relatively easy to insulate.

Restaurants, public houses and workshops have the highest proportion of poor performing buildings. For restaurants, this may be due to high ventilation requirements and limited scope for heat recovery. Public houses are often found in older buildings where fabric and lighting performance may be poor with limited scope for improvement, particularly as they are often leasehold properties.

Figure 4: Distribution of Energy Performance Certificate ratings by building sector: 2008 - 2013



Source: Energy Performance Certificate data

Chapter 4:
Cost-effective approaches to building renovation

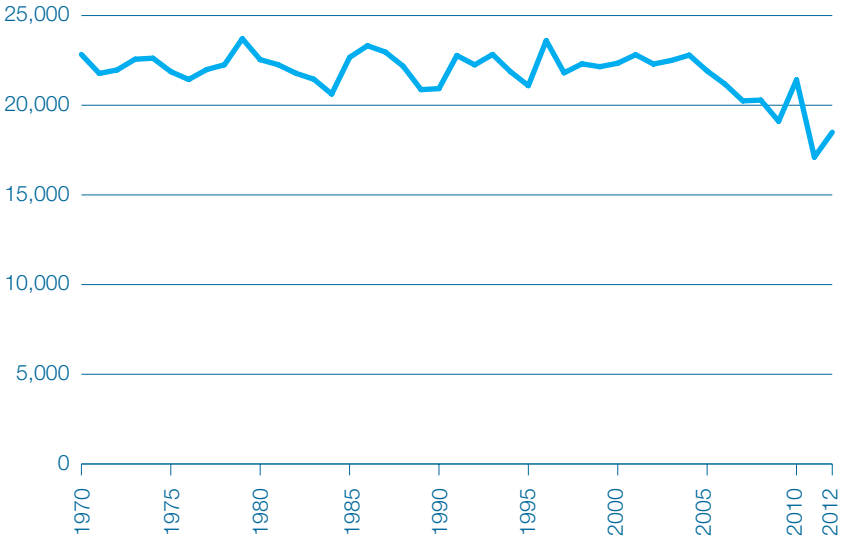
4.1 Domestic

This section covers the main ways in which buildings can be renovated to incorporate energy efficiency features cost-effectively, in that the cost of their installation is paid back in energy savings over their lifetime. The products and technologies used within the process of building renovation are largely referred to as 'measures' throughout the chapter.

Technical opportunity for renovation

UK Government policies have done much in the past to address the barriers to the take up of energy efficiency measures. Figure 5 shows total energy usage declining, but this does not reflect the effects of underlying energy consumption trends. UK household energy consumption increased by 22% between 1970 and 2007. The Building Research Establishment model estimates that if no new insulation and no new efficient heating measures had been installed since 1970, it would have more than doubled.[10]

Figure 5: Average domestic energy usage per household (kWh) 1970-2012



Source: Energy Consumption in the UK

[10] All figures in this paragraph taken from DECC, Energy Efficiency Statistical Summary, 2012.

However, there is still a significant opportunity for further efficiency savings. The remaining potential for the main energy efficiency measures are summarised in the table below.

Table 1: Remaining potential for measure within UK housing stock

Measure	Remaining number of houses with potential for measure (millions)[47]
Solid wall insulation	7.3
Cavity wall insulation	5.1
Loft insulation	7.4
Floor Insulation	20.1
Double glazing	19.2
Insulated, energy efficient doors	11.1
Draught proofing (draught stripping)	1.9
Reduced infiltration (foam, strips, sealant use)	23.7
Boiler upgrade	17.6
Heating controls	1.6
Hot Water Cylinder thermostat	4.6
Hot water tank top up insulation	5.0
Energy efficient lighting	(See tables 1&2 p17)
Passive Flue Gas Heat Recovery	7.6
Smart meters – electric	24.9
Smart meters – gas	22.8

Source: Wall and loft insulation figures from ECO and Insulation Levels, up to December 2013 statistics. Other figures taken from 'Review of potential for carbon savings from residential energy efficiency' report for Committee on Climate Change[12]

The Energy Efficiency Marginal Abatement Cost Curve (EE-MACC) estimates the energy savings, measured in terms of final energy consumption that could be achieved in a given year through implementing energy efficiency measures between now and that year. Measures are included in the EE-MACC if they have the potential to reduce the amount of energy needed to deliver energy services to a consumer, for example in the domestic setting insulation reduces the amount of gas needed to heat a home to the desired temperature, or in an industrial setting buying new equipment that reduces the amount of energy to produce the same level of output. The energy saving potential for a range of energy efficiency measures is listed in table 2, measured in terms of final energy consumption that could be achieved in a given year, through implementing energy efficiency measures between now and 2020.[13] Of these measures, the highest energy saving potential comes from building fabric measures and heat pumps. However heat pumps are only efficient and cost effective when installed in homes with high levels of insulation that are relatively airtight.

[11] The technical potential for the installation of each measure is the number of homes that have potential for the measure to be installed. The technical potential has been disaggregated across a range of house types based on a segmentation of the UK stock. See 'Review of potential for carbon savings from residential energy efficiency' (Element Energy & Energy Saving Trust, commissioned by the Climate Change Committee).

[12] 'Review of potential for carbon savings from residential energy efficiency' (Element Energy & Energy Saving Trust), commissioned by the Climate Change Committee).

[13] Energy Efficiency Strategy, 2013 update (DECC) (Annex E).

Table 2: Energy saving potential for measures

Measure	Energy Savings in 2020 TWh (rounded to nearest TWh)
Air Source Heat Pumps	15
Internal Solid Wall Insulation	10
Ground Source Heat Pumps	9
Smart Meters	8
Hard to Treat Cavity Insulation	5
External Solid Wall Insulation	3
Easy to Treat Cavity Insulation	3
Loft Insulation	1
Total	**54**

Source: DECC EE-MACC for 2020[14]

Building fabric measures

Uninsulated cavity walls are much less thermally efficient than modern insulated cavities. From the mid-1980s onwards, Building Regulations have required cavity wall insulation to be installed at the point of construction. For those buildings with cavity walls built before the mid-1980s, many have been filled through previous policies such as supplier obligation schemes like CERT (formerly the Energy Efficiency Commitment) and the Community Energy Saving Programme (CESP).

Of the remaining 5.1 million homes that could have cavity wall insulation, there are 0.7 million easy-to-treat standard cavities remaining which are the most cost effective to implement. Current policy is making substantial inroads into realising this remaining potential.[15]

The majority of the remaining uninsulated properties are deemed hard to treat (3 million). This means that installing cavity wall insulation is not straightforward and is less cost-effective, or is not recommended.

Table 3: Remaining potential for cavity wall insulation

Insulated (000's)			Remaining potential (in 000's)[2]			
Insulated	Insulated or equivalent	Uncertainty[1]	Limited potential[3]		Not insulated	
			Easy to treat	Hard to treat[4]	Easy to treat	Hard to treat[4]
13,610	3,010	480	**940**	**500**	**710**	**3,000**

[1] Properties which may or may not have cavity wall insulation.

[2] Not all remaining potential properties could be insulated and some which could be insulated would not be cost effective to insulate. This could be due to properties being hard to treat, having limited potential to save energy or having unfillable cavities.

[3] Although these properties are not fully insulated it is likely that they already have a relatively good thermal performance which means savings from having cavity wall insulation installed would be lower than for older properties. Limited potential properties are those built between 1983 and 1995 for England and Wales, and between 1984 and 1991 for Scotland.

[4] Includes properties which are unfillable. These are properties which have a timber frame wall type with both a studwork cavity and a masonry cavity. In this wall type the studwork cavity contains insulation and the masonry cavity does not contain insulation.

Source: DECC home insulation figures for December 2013

[14] Note: Policies implemented before 2009 are excluded from this potential.

[15] The latest statistics on the number of cavity wall insulations is available from https://www.gov.uk/government/collections/green-deal-and-energy-company-obligation-eco-statistics

Insulating solid walls, either externally or internally, offers great energy saving potential. Solid wall homes – typically built in the UK before 1919 – have only a single skin of brick and lose heat faster than uninsulated cavity wall homes. Health risks from cold and damp are much more prevalent in these properties.[16]

Around 7 million solid wall homes remain with a high potential to benefit from wall insulation. These homes can be fitted with external or internal insulated linings, or a combination of the two and a typical household saves around a fifth on their energy bill. However, the market for this technology is in its infancy and potentially not prepared for mass installation. For example, in certain circumstances risks around moisture in the structure need to be properly managed first. Additionally, while insulation delivers significant bill savings, solid walls are relatively costly to insulate, payback times are longer, and there is disruption to the occupants during installation.

The majority of solid wall insulations are currently delivered through the Energy Company Obligation (ECO) and commonly carried out by larger landlords to multiple dwellings.[17] In recognition that cost is a significant barrier to the development of the solid wall insulation market, in February 2014 the Government announced a significant financial incentive as part of the Green Deal Cashback scheme with up to £4,000 grants now available for solid wall insulation, up from £650.[18]

Table 4: remaining potential for solid wall insulation (in 000's)

Insulated	Uncertainty[19]	Remaining potential[20]
232	126	**7,630**

Source: DECC home insulation figures for December 2013[21]

As with cavity wall insulation, much has been done to insulate lofts through previous energy efficiency schemes (see Figure 15 in Annex B(i)). There are now very few lofts remaining with no insulation but there remain a significant number of homes that would benefit from additional loft insulation (7.4 million as shown in table 1).

Current building regulations for new homes require a roof to have approximately 300mm of loft insulation. Existing buildings have varying depths of insulation, with increased insulation giving diminishing returns.

A small but significant proportion of lofts are considered impractical to insulate, for example where there is limited access. About 15% of the UK building stock falls into this category.

16 Housing Health and Safety Rating System: Operating Guidance, ODPM, 2006.

17 ECO requires energy suppliers to carry out insulation measures in poorly insulated buildings in areas that would benefit from it most. ECO is discussed in section 5 on current policy.

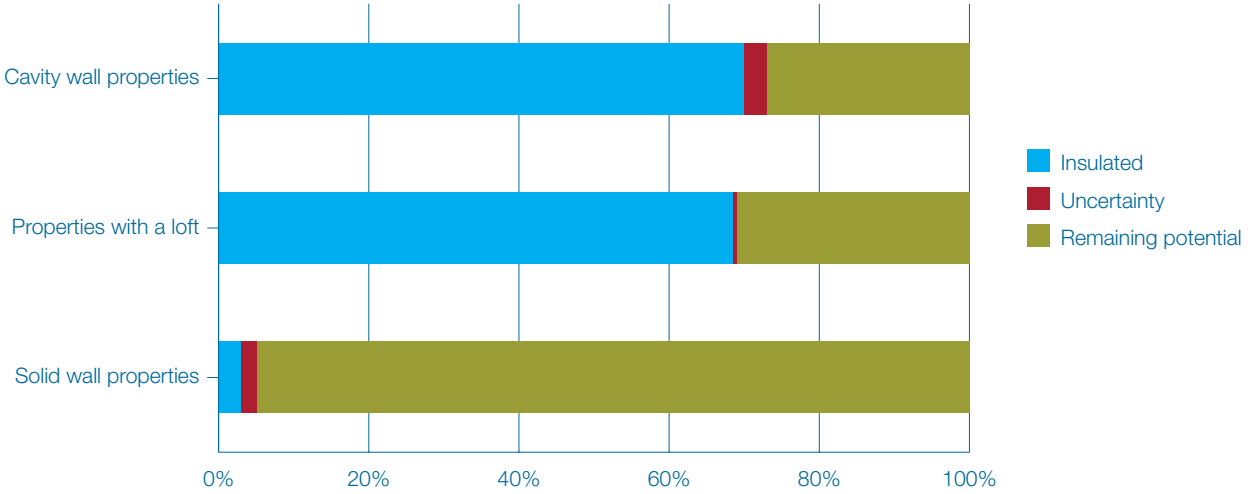
18 https://www.gov.uk/government/news/more-cash-back-for-people-carrying-out-green-deal-home-improvements

19 Properties which may or may not have solid wall insulation.

20 Not all remaining potential properties would be insulated as it is likely that some of these would be too costly to treat or be within conservation areas.

21 DECC Statistical release: estimates of home insulation levels in Great Britain, December 2013.

Figure 6: Remaining potential to insulate the UK's housing stock (December 2013)



Source: DECC home Insulation levels in Great Britain: December 2013[22]

Floor insulation is required in many properties – in newer properties it is laid on top of concrete floors, and in older and historic homes it is fitted between wooden floorboards and the ground.

Improving air-tightness to a very high standard is also important: mechanical ventilation and heat recovery can play an important role in homes that are very airtight.

Upgrade of building services

Amongst the potential for improvement in fixed building services, there are a number of significant measures that are driven by policy.

An upgrade to an efficient condensing boiler whenever they are replaced is a key measure to improve the energy efficiency of a large majority of UK homes, driven by Building Regulations.[23]

The mass roll out of Smart Meters is an enabling technology for managing energy demand within buildings, either through technologies that allow more efficient management of energy use, or changed occupant behaviour. The implementation of smart meters in some countries has resulted in total energy savings of between 5-15%. The Government estimates that savings of at least 1-3% can be achieved in the UK.[24]

There are also still significant opportunities for improved lighting efficiency with the continuing replacement of incandescent bulbs with more efficient alternatives such as CFL and LED lighting. In particular, the switch from halogen down lighters to LEDs: 50% of lighting energy consumption is by halogen bulbs but they account for 37% of light fittings, whereas LEDs use 1% of lighting energy from just 1% of fittings.[25]

Increasingly stringent EU minimum energy performance standards will see more efficient appliances enter the marketplace.[26]

Renewable energy options

There is ample opportunity to install solar photovoltaic (PV) across homes in the UK where

[22] DECC Statistical release: estimates of home insulation levels in Great Britain, December 2013 Chart 2.6, p33.

[23] This is discussed in more detail in section 5 *Policies to stimulate energy efficient renovation* (see Box 4: Building Regulations and Condensing Boilers).

[24] DECC *Smart Meter Rollout Impact Assessment*, 2013.

[25] See tables 7 and 8 in Annex B(i).

[26] Committee on Climate Change *Fourth carbon budget – technical report: Sectoral analysis of the cost effective path to the 2050 target.*

roof space and structures permit. In order for solar PV to be efficient and effective, systems need to be appropriately sized and sited, ideally on south-facing roofs at the correct angle, avoiding shaded areas. The cost of solar PV is estimated to have reduced by 50% between 2010-2012[27] and PV has the highest public approval of all renewable technologies at 85%[28] which makes it more acceptable to neighbours and generally easier to obtain planning permission where required.

Unlike gas and oil boilers, heat pumps work best at delivering heat at lower temperatures over much longer periods. Heat pumps have therefore been shown to be more effective in well insulated homes with good levels of airtightness. Ground source heat pumps are the most common type in the UK. They are more cost effective when replacing an electricity or coal heating system. Heat pumps require a greater amount of electricity to operate than gas boilers and the ratio of electricity used to heat output (the Coefficient of Performance) would need to be 3.5 or more, when replacing a gas boiler, for it to be cost effective. Following the introduction of the domestic RHI scheme, it is estimated that heat pumps will be increasingly cost-effective in the coming decades.

Renewable energy policy has an additional role to play in encouraging energy efficient renovation. As well as reducing energy demand from the grid for individual buildings, the FITs and domestic RHI schemes that promote the development of this market also stipulate minimum energy efficiency standards before applicants can receive higher tariffs.[29]

Packages of measures

If we are to achieve our 2050 goals, UK homes will require not just one but a combination of these measures. A package of measures is required across virtually all UK homes to bring them up to a standard of EPC rating “B” (equivalent to the current new build standard). Table 5 describes potential combinations of measures that would be required to bring a variety of typical domestic dwelling types today up to a “B” EPC rating.

[27] Provided as part of the FITs Comprehensive Review by Cambridge Economic Policy Associates (CEPA) Cambridge Economic Policy Associates Ltd and Parsons Brinckerhoff (2011) *Updates to the Feed-in Tariff Model Documentation of Changes for solar PV Consultation*.

[28] DECC (2013) Public Attitudes Tracker Wave 5.

[29] See section 5.3 for further detail of Feed in Tariffs and the Renewable Heat Incentive.

Table 5: Typical packages of measures

House type	Typical package of measures to bring to a new build standard (an EPC band "B")
19th century end-terrace house	• Insulated roof • Internal solid wall insulation • Insulated suspended timber floor • Windows – double glazed, timber frames 1.50 W/m²K (BFRC g-value of glazing – 0.45 W/m²K) • Doors – insulated panel **Services improvements** • Mechanical ventilation with heat recovery • Regular condensing boiler, 89% efficiency, programmer, room thermostat and thermostatic radiator valves • Water storage cylinder (110 litre capacity) 80mm factory cylinder insulation, all pipework insulated. • 100% dedicated low energy lighting
Early 20th century detached home	• Insulated roof • Solid walls – internal insulation • Insulated replacement concrete floor • Windows – double glazed, timber frames • BFRC g-value – 0.45 W/m²K 1.50 W/m²K • Doors – insulated panel **Services improvements** • Mechanical ventilation with heat recovery • Regular condensing boiler • Room thermostat and thermostatic radiator values • Water storage cylinder – 160 litre capacity, 80mm factory cylinder insulation, all pipework insulated. • 100% dedicated low energy efficient fixed light fittings.
Mid 20th semi-detached home	• Insulated roof • Unfilled cavity party wall • insulated roof Insulated cavity walls – internal insulation • Insulated replacement concrete floor 0.12 W/m²K • Windows – double glazed, timber frames 1.50 W/m²K (BFRC g-value – 0.45 W/m²K) • Doors – insulated panel **Services improvements** • Mechanical ventilation with heat recovery 85% efficiency, specific fan power 0.75 W/l/s, air leakage rate reduced to 3 m³/hr/m² @ 50Pa. • Regular condensing boiler – 89% efficiency, weather compensation and delayed start, programmer, room thermostat and thermostatic radiator values (no secondary room heating needed). • Water storage cylinder – 110 litre capacity, 80mm factory cylinder insulation, all pipework insulated. • 100% low energy efficient lamps in fixed light fittings.
1980s mid-floor flat	• Cavity walls – internal insulation • Edge sealed clear cavity party walls • Windows – triple glazed, timber frames • 1.50 W/m²K • (BFRC g-value of glazing – 0.45 W/m²K) • Doors – insulated panel **Services improvements** • Mechanical ventilation with heat recovery 85% efficiency, specific fan power 0.75 W/l/s, air leakage rate reduced to 3 m³/hr/m² @ 50Pa. • Heated corridors. • Electric convector room heaters, programmer and room thermostat. • Instantaneous hot water at point of use. • 100% dedicated low energy efficient fixed light fittings.

The policy framework for promoting these energy efficiency measures is explored in the next section. In particular, EPCs and the Green Deal assessment and report both provide potential renovators with a list of energy efficiency improvements and details of how much they might save individually, and in combination when installed in the most cost effective order. These reports are therefore an effective way of increasing awareness of cost effective packages of measures to guide renovation decisions.

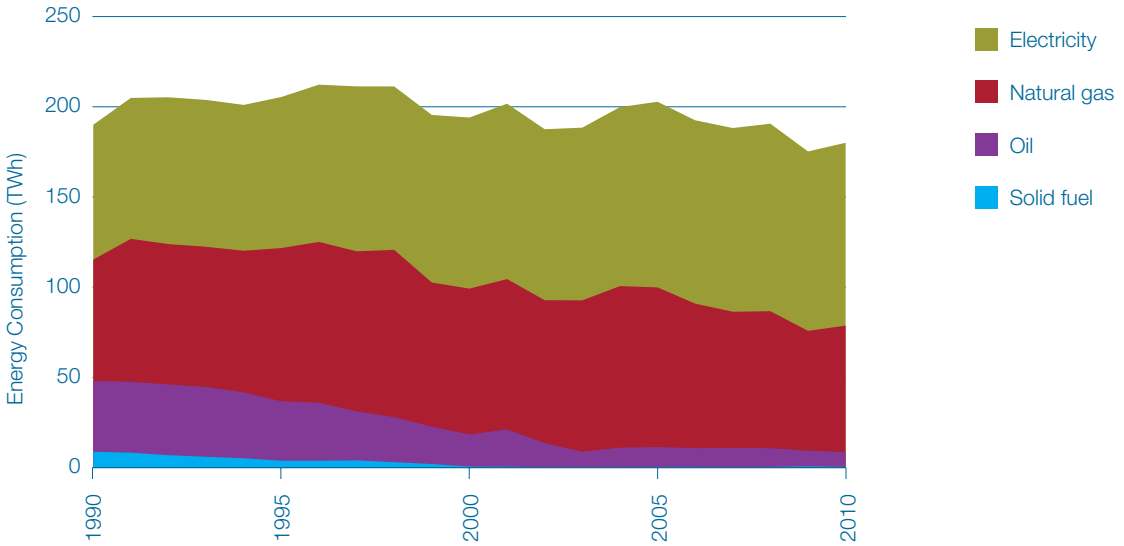
The number of assessments is increasing rapidly with 188,234 lodged up to the end of March 2014, up from 163,096 at the end of February 2014.[30]

4.2 Non-domestic

Historic energy consumption

Total energy consumption for non-domestic buildings in the UK dropped by around 5% between 1990 and 2010.[31]

Figure 7: Historic energy consumption for non-domestic buildings: 1990 – 2010



Source: Energy Consumption in the UK

There is a recognised need to improve the evidence base on the energy efficiency savings that could be achieved through different measures in the non-domestic sector, and the Buildings Energy Efficiency Survey project represents a significant step forward on this issue. From the data currently available, it is clear that significant energy savings could be achieved in non-domestic buildings through the implementation of cost effective measures, primarily in space heating, particularly through the installation of measures like insulation, draught proofing and building control systems.[51] Ultimately a change in fuel source for heating will be required to help meet the UK's target to reduce carbon emissions reductions by 80% by 2050.

Measures that cost effectively reduce energy consumption have been identified in the UK Energy Efficiency Marginal Abatement Cost Curve (EE-MACC) published in the Government's Energy Efficiency Strategy[32] and are outlined in Box 4, pg. 13.

[30] DECC, *Green Deal and Energy Company Obligation (ECO):monthly statistics, March 2014.*

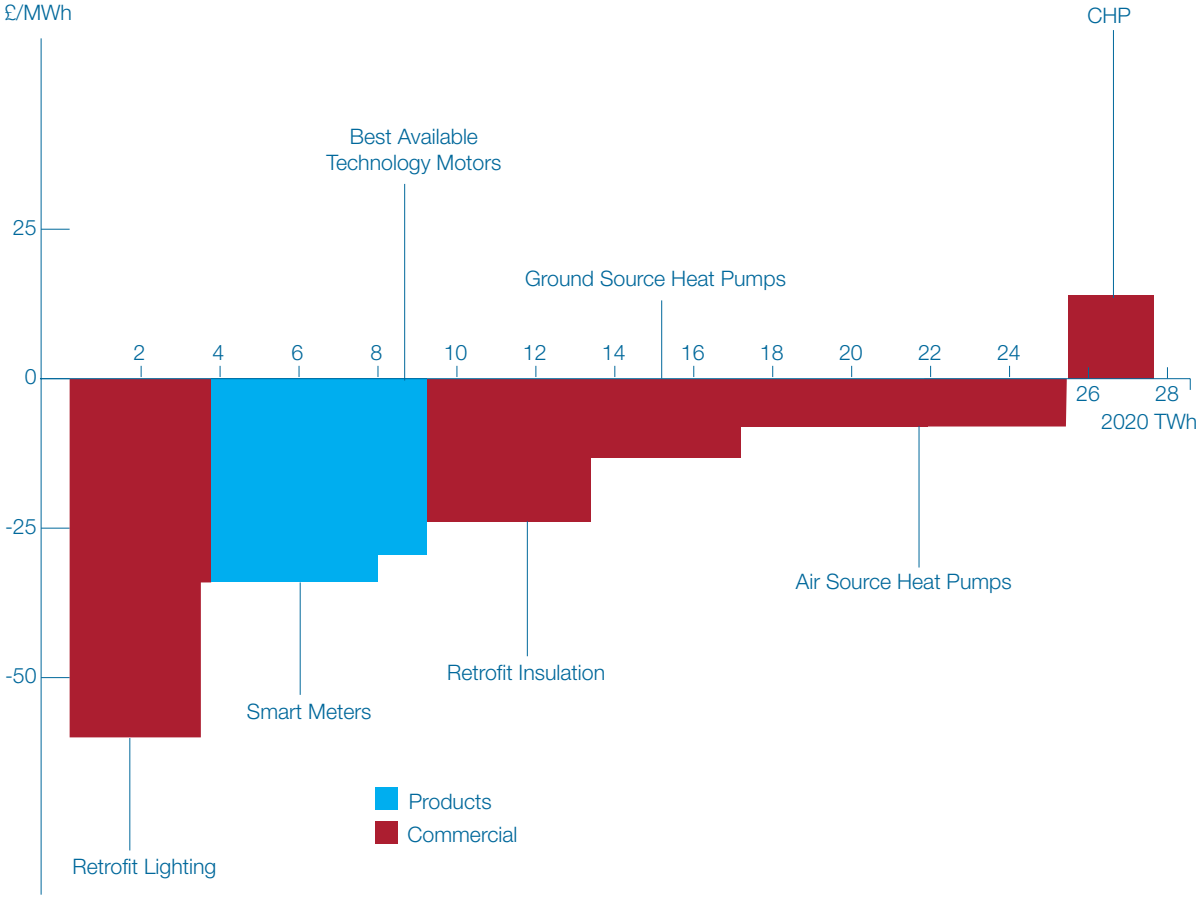
[31] Low Carbon Routemap for the UK Built Environment, Green Construction Board, March 2013.

[32] The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, Department of Energy and Climate Change 2012.

A Marginal Abatement Cost Curve for cost effective non-domestic measures is shown below. It is estimated that the implementation of all the measures shown could result in annual energy savings of 27 TWh by 2020.[33] The majority of the potential savings relate to heating energy, whilst the most cost effective measures are replacing light fittings and controls, and provision of smart metering.

Within the public sector[34] some of the measures with the greatest energy saving potential include estate rationalisation, optimising existing building systems, and carbon and energy management. For energy intensive NHS buildings, renewable energy technologies can also be cost effective and offer significant savings potential, while for local authority buildings, with larger base heat demands, combined heat and power may be cost effective. For the central government estate, there is a requirement to meet a 25% reduction in greenhouse gas emissions under the Greening Government Commitments. This is part of Government's vision to embed sustainability in all it does, including the way the Government estate is run.[35]

Figure 8: Marginal Abatement Cost Curve for non-domestic measures in 2020



Source: The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, Department of Energy and Climate Change 2012

[33] Obtained from DECC data.

[34] Wider public sector emissions reduction potential research, Camco, 2011.

[35] See Section 6 for further detail.

Box 2: Cost effective measures to reduce energy consumption

Electrical energy efficiency: The most cost effective retrofit energy efficiency measure is lighting. This includes installing presence detection control and replacing lamps and fittings.

The use of smart meters will enable occupiers to better understand their energy consumption and encourage both energy efficient building operation, such as switching off PCs when not being used, and also the purchase of energy efficient equipment, such as printers and fridges. Switching monitors off as part of an energy management programme is one of the top energy saving measures in non-domestic buildings.[36]

The efficiency of motors in fans, pumps and lift mechanisms can be improved by installing variable speed drives, automatic controls to switch them off when not required, and effective management, repair and maintenance.

Heating energy efficiency: Heating energy can be reduced by implementing relatively simple and cost effective measures such as programmable thermostats, reducing room temperatures, installing more energy efficient boilers, optimising system start times, and installing TRVs. Cost effective insulation measures can include installing roof and wall (cavity and internal) insulation, and low emissivity glazing.

Low carbon energy supply: Ground source and air source heat pumps can be used for heating and cooling.[37] Viability for retrofitting ground source heat pumps will be dependent on land availability around the building for installing the underground pipes.

The cost effectiveness of combined heat and power (CHP) systems is highly site specific. A common cost effective retrofit application is the replacement of a boiler with a CHP unit in a central energy centre for a hospital or university campus.[38]

Behavioural measures: Significant potential has been identified from behavioural savings, particularly associated with the roll out of smart meters. There is a much greater range of control options for energy consuming systems which can be retrofitted in non-domestic buildings compared with domestic properties. This includes simple devices such as TRVs as well as full Building Energy Management Systems retrofitted with minimum disruption through the use of wireless meters and sensors. Product innovation is producing much more intuitive user interfaces and visual displays for these systems leading to greater engagement and understanding of energy consumption patterns by occupants.

[36] Building the future, today, Carbon Trust, 2009.

[37] For heating they are typically paired with low temperature systems such as underfloor heating to maximise their efficiency. Cooling efficiency can be increased through the use of passive cooling techniques e.g. running fans at night to purge the building of heat, or removing suspended ceilings to expose concrete thermal mass.

[38] The CHP is typically sized to provide the baseload heating requirement, generating up to 70% of the annual heat required with boilers only operating at times of peak demand, supplemented by thermal storage.

Packages of measures

The Government wants to help businesses cut the cost of their energy bills and reduce their energy consumption and carbon emissions through improved energy efficiency. This includes both developing new policies and incentives, and strengthening existing policies, to encourage the take up of a package of measures, either as a single package or staged renovation, over a period of time.[39]

For all types of non-domestic buildings, the Government continues to strengthen energy efficiency standards when building owners carry out building work to existing properties. Under planned changes to Part L of the Building Regulations, we have recently implemented tight carbon compliance standards for existing non-domestic buildings for specific building services work such as fan coil unit, chiller and lighting replacements.[40] This sets out an increase in energy efficiency standards for these systems.

For large enterprises, the introduction of the Energy Savings Opportunity Scheme (ESOS) in June 2014 will target a gap in the existing policy landscape and help them to cut their energy costs, by providing targeted cost-effective recommendations to improve their energy efficiency. It will stimulate demand amongst UK businesses for energy efficiency measures, by making clear in the assessments what savings could be made. The assessments will review the organisations' entire energy consumption including buildings, industrial processes and transport activities.

[39] See Section 5 for more information on policies relating to the non-domestic building sector.

[40] Changes to Part L of the Building Regulations 2013: Impact Assessment, DCLG, 2013.

Chapter 5: Policies to stimulate energy efficient renovation

5.1 A long-term Strategy for driving energy efficient renovation in the UK

The Government is committed to improving the energy efficiency of the UK's building stock, as we work towards cutting carbon emissions by 80% by 2050. The 2008 Climate Change Act sets out the UK's commitment to reduce carbon emissions by 80% by 2050 relative to 1990 levels. Alongside this, the carbon budget framework was established; this requires the Government to set five-yearly carbon budgets and monitor progress against them. The long-term target and regular budgets work together to provide confidence to investors in terms of the UK's ambition to transition towards a low carbon economy.

This strategy for building renovation refers to the policies and analysis that influence building renovation contained in existing Government strategy documents; in particular the Energy Efficiency Strategy,[41] the Carbon Plan,[42] and The Future of Heating.[43] The overarching approach to energy efficient renovation applies the same principles to both domestic and non-domestic buildings:

- making buildings more thermally efficient through better insulation and improved airtightness
- improving the efficiency of heating systems through the use of more efficient boilers, and supporting the transition to lower carbon and renewable energy fuels and technologies
- reducing electricity use through improved energy management systems and technologies, enabled by the introduction of smart meters and more efficient energy services within buildings

Government policy works to stimulate the market for energy efficiency to help achieve these objectives. A long-term policy framework and targets help to remove barriers to take up and stimulate investment in research and innovation of new technologies. When new technologies or measures are introduced to the market they may require incentives and policies to promote them – this helps to increase uptake and drive costs down. As measures become more cost effective, minimum standards can sometimes help to ensure they become the norm. This can include reporting standards and data sharing initiatives, such as mandatory greenhouse gas emissions reporting, which encourage action between organisations and make companies more accountable to their shareholders and to the public.

[41] Energy Efficiency Strategy, DECC, November 2012 and Energy Efficiency Strategy 2013 Update, DECC, December 2013.

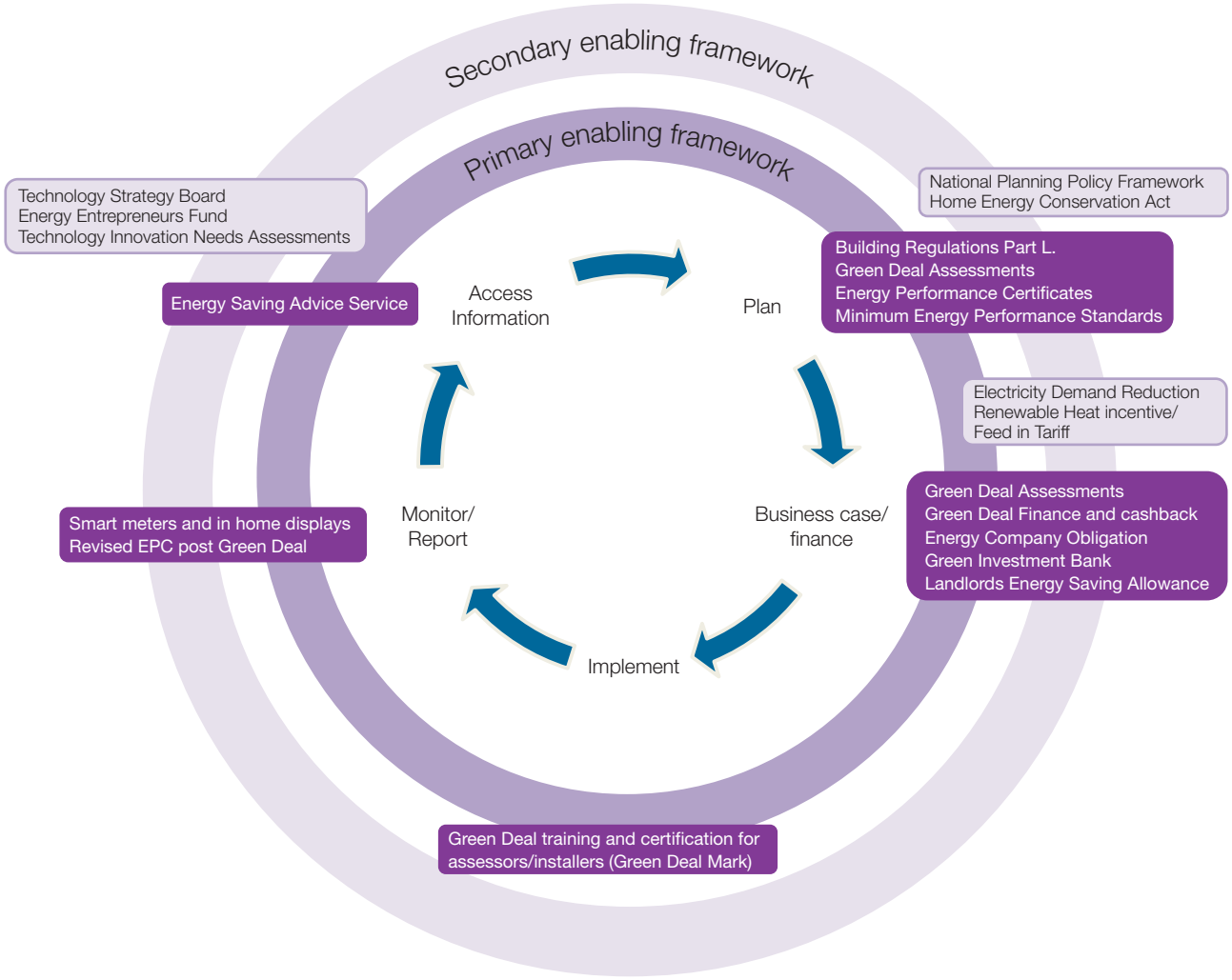
[42] Carbon Plan, DECC, originally published in December 2011 and most recently updated in April 2013.

[43] The Future of Heating, DECC, March 2012.

Figures 9 and 10 show how domestic and non-domestic policies and incentives act at the individual property level throughout the refurbishment cycle, influencing investment decisions of building owners at key trigger points when renovation is considered.

The framework of current policies represents a comprehensive package of measures, acting at all stages of the refurbishment cycle to overcome the key barriers.[44]

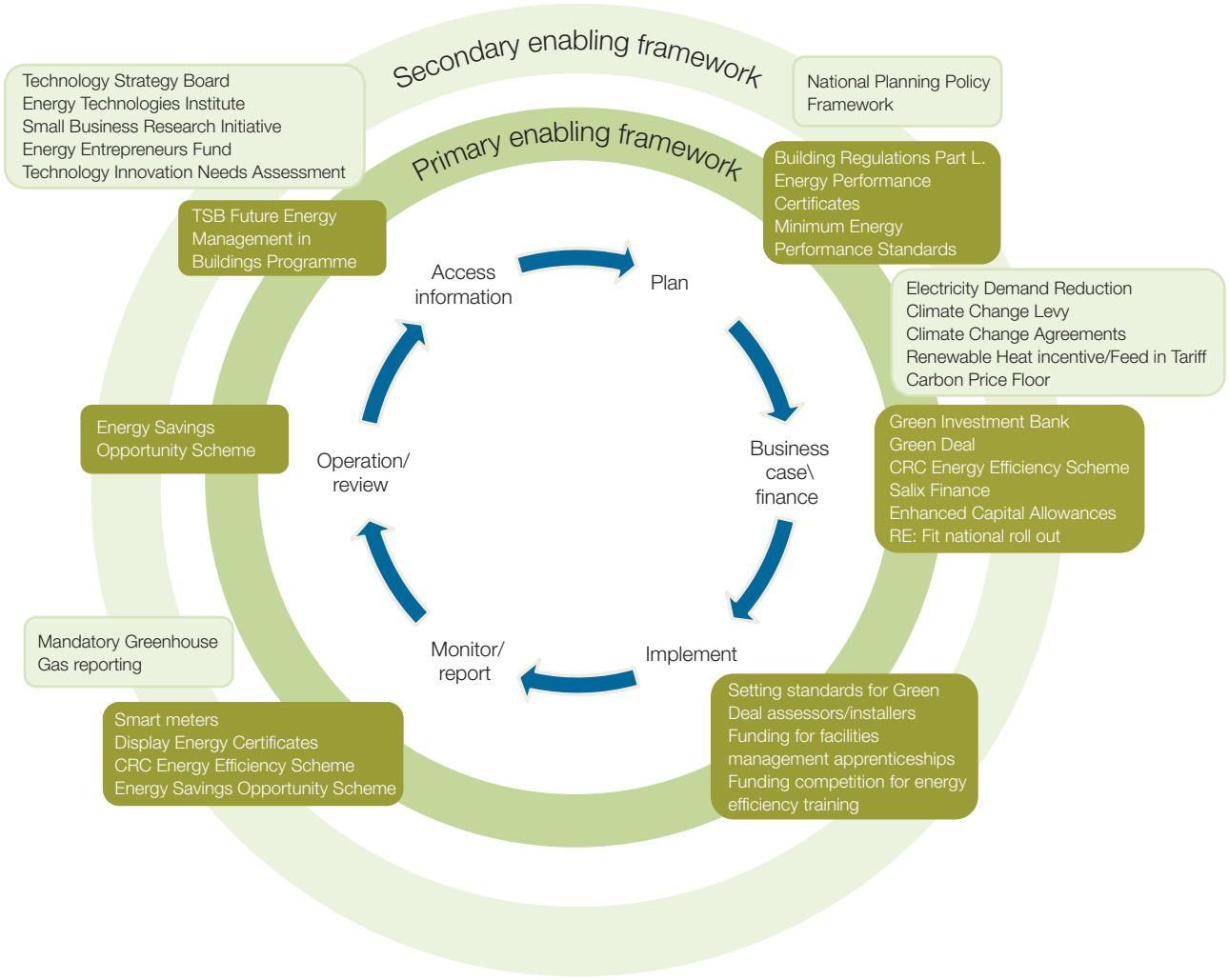
Figure 9: Domestic refurbishment cycle and associated policy framework[45]



[44] see box 3 for an explanation of the common barriers.

[45] Current policies and incentives are presented as part of a primary or secondary enabling framework depending on whether they directly or indirectly influence the building refurbishment market. The primary enabling framework works directly to increase the implementation of energy efficiency measures as part of building renovation. Policies within the secondary enabling framework are broader, but still impact on energy efficiency in renovation.

Figure 10: Non-domestic refurbishment cycle and associated policy framework



Box 3: The barriers to Energy Efficiency take up

The UK *Energy Efficiency Strategy* identified **four key barriers** to the deployment of cost-effective energy efficiency investments in the UK economy. These barriers are interrelated and act together to reduce investment.

Embryonic markets: The UK already has an energy efficiency market but it is small relative to the size of the opportunity. There are significant economic benefits to be realised from growing this market and making energy efficiency a mainstream activity.

Information: Accessing trusted and appropriate energy efficiency information has often proven difficult. Where information is available it is usually generic and not tailored to specific circumstances; or it is focused on particular opportunities, meaning that individuals and businesses are unable to fully assess the benefits of the energy efficiency opportunity.

Misaligned financial incentives: Those investing in energy efficiency measures are not always the ones receiving the direct benefit. For example, the wider benefits of energy efficiency investment, such as improved security of supply and reduced carbon emissions, are not fully realised by those making the investment. This is sometimes referred to as the 'split incentive problem'.

Undervaluing energy efficiency: The long term financial and wider benefits of improved energy efficiency are often regarded as less certain, partly because of the lack of trusted information in the market. Consequently, energy efficiency has traditionally been undervalued relative to other investment options and not prioritised as it might otherwise be.

5.2 Minimum Standards

Minimum standards work together with investment in research and development and innovation, which are discussed later in this section.

Domestic Buildings

Underpinning all policy affecting building renovation are various UK and European standards and codes. Building Regulations[46] set minimum energy efficiency standards whenever certain types of building work are carried out on new and existing buildings. Energy standards have been in place since the 1970s and have been steadily tightened, leading to increasingly better standards for insulation, glazing, airtightness and the efficiency of fixed building services such as heating, lighting and controls. Part L of the Building Regulations, introduced in April 2006, addresses the conservation of fuel and power and sets out energy efficiency standards that apply to renovations.

Building regulations are a very effective way of driving energy efficient improvements, as demonstrated by the introduction of minimum standards of efficiency for new and replacement gas condensing boilers (see Box 4).

[46] Building regulations are devolved across the four UK administrations but are implemented with broadly the same scope, intent and timetable across the UK. See section 5.5 on policies of devolved governments for further information.

Box 4: Building Regulations and Condensing Boilers

In April 2005 Building Regulations (2005/6) (England and Wales only) introduced a minimum efficiency standard of a B rating when installing a new gas condensing boiler and in 2010 this was raised to an A rating. 1.5 million boilers are replaced per annum, so these regulations have had a rapid effect and will substantially increase the efficiency of our fossil fuel heating systems. Additional financial incentives such as a boiler scrappage scheme encouraged consumers to replace their boilers. It is estimated that the 2020s will see the replacement of most of the remaining 13 million non-condensing gas boilers with high-efficiency condensing boilers.

New Build Homes

Recent updates to building regulations were made in 2006 and 2010, with a further set of changes to take effect in 2014. This steady improvement is leading towards the introduction of the **Zero Carbon Homes Standard** for new homes in England in 2016.

The Government's target to make all new homes in England zero carbon from 2016 is one of the most stringent in the world, demanding that regulated emissions (effectively emissions from heating, lighting and ventilation) must be net zero over the course of a year. For each home, compliance with the standard involves achieving the overall target and also a set of minimum standards for fabric energy efficiency and on-site carbon emissions. The Government also ran a consultation on proposals for Allowable Solutions between August and October 2013. The aim of Allowable Solutions is to offer house builders the ability to achieve the Zero Carbon Standard through the use of a carbon offsetting process where this is not cost effective to deliver on-site. This could be achieved through various measures including improving the energy efficiency of the existing housing stock.

Existing Building Renovation

Published in March 2012, the Government's **National Planning Policy Framework**[47] provides an overarching framework for how local authorities can support the transition to a low carbon future. The Framework expects local planning authorities to actively support energy efficiency improvements to existing buildings and, when setting any local requirement for a building's sustainability, to do so in a way consistent with the Government's zero carbon buildings policy. The Framework works together with the Government's recent Community Energy Strategy[48] to support community-led initiatives for renewable and low carbon energy developments, as well as decentralised energy supply systems and the co-location of potential heat customers and suppliers.

Other standards in force which influence building renovation include the **Decent Homes Standard** which sets minimum requirements for social housing in England. The Standard includes a requirement for 'reasonably modern' insulation and heating systems.[49] Significant government investment to bring properties up to this standard has meant that the vast majority of the UK's social housing stock now meets this Standard. Similarly, environmental health regulations require that homes in England should not put occupiers at risk of hazards, including excess cold. The **Housing Health and Safety Rating System** is a risk assessment process which considers the likelihood of an incident arising as a result of the condition of the property

[47] National Planning Policy Framework, CLG, March 2012.

[48] Community Energy Strategy, DECC, January 2014.

[49] The precise criteria vary according the nature of the heating system in the home, but where present, cavities should be filled and for electrically heated homes at least 200mm of loft insulation should be installed or in homes with oil/gas programmable heating 50mm of loft insulation should be considered the minimum. Further detail at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7812/138355.pdf

and the likelihood of a harmful outcome. It assesses 29 categories of housing hazards, including excess cold.

The **Energy Performance of Buildings Directive** (2002) introduced energy labelling for both domestic and non-domestic properties when they are built, sold or rented. Energy Performance Certificates (EPCs) were introduced progressively for different types of buildings in the UK. They are helping consumers recognise the value of an energy efficient home (see box 5).[50] Display Energy Certificates (DECs) are the equivalent for large non-domestic buildings used by the public sector, and were introduced in October 2008.[51] Both certificates provide users of the buildings with information about the relative energy efficiency of the building.

EPCs are starting to address the barrier of misaligned financial incentives, particularly in the private rented sector. It is typically landlords who invest in energy efficiency measures but it is the tenants who benefit from reduced bills. The Green Deal provides a mechanism to overcome this barrier by enabling landlords to make energy efficiency improvements without having to pay for the cost upfront.

The Energy Act 2011 contains provisions for regulation to drive the take-up of energy efficiency improvements in the domestic and non-domestic private rented sectors. The use of these regulation-making powers is conditional on there being no net or up-front costs to landlords. Provided that these conditions are adhered to, the Government intends to use these powers for England and Wales so that:

a. Domestic private landlords will not be able to unreasonably refuse requests for consent to energy efficiency improvements from their tenants, where financial support is available, such as Green Deal finance or ECO, with the first tenants' energy efficiency improvements regulations coming into force by 1 April 2016.

b. There will be a minimum energy efficiency standard for privately rented housing and non-domestic property, with the first domestic and non-domestic energy efficiency regulations coming into force by 1 April 2018. To ensure there are no net or upfront costs to landlords, a property below the minimum standard may be let where all improvements possible within the Green Deal's Golden Rule are undertaken, taking into account any funding support available such as ECO.

Box 5: Government research shows that energy efficiency improvements can increase property value

A Government study has shown that the benefits of energy efficiency extend beyond lowering the cost of bills and cutting carbon emissions. The study found that having a more energy efficient rating can increase a property's value, demonstrating that house buyers and estate agents are beginning to recognise the value of energy efficiency measures. For an average home in England, improving its Energy Performance Certificate rating from band G to E, or from band D to B, could add more than £16,000 to the sale price of the property. This represents a significant development, particularly in the context of the misaligned financial incentives barrier.

[50] DECC, An investigation of the effect of EPC ratings on house prices (June 2013). Note: The sample size of this study was large enough to mitigate the impact of other characteristics, such as aesthetics, on the average price differential.

[51] public buildings in Scotland must have an EPC, not a DEC.

In 2010 the Government proposed the replacement of 53 million meters with **smart electricity and gas meters** in all domestic properties, and smart or advanced meters in smaller non-domestic sites, impacting approximately 30 million premises.

The roll out of smart meters into homes across Great Britain will remove the need for estimated billing, help households better manage their energy consumption, facilitate faster switching between suppliers and drive a more vibrant and competitive market that will foster the development of new energy products and services. Near-real time information from smart meters will help put consumers in control of their bills, leaving them better placed to reduce energy consumption.

The UK Government is leading a programme of work with industry to put in place the regulatory, commercial and technical requirements for smart metering in Great Britain. Most householders will have smart meters installed by their energy company between 2015 and 2020, although some energy companies are starting to install smart meters now. To protect consumers, the Government has developed a smart meter installation Code of Practice which will ensure that installers provide information about how smart meters can be used to improve energy efficiency.

The introduction of smart meters will assist the transition to smart grids and mean that energy networks can use the more granular information to better manage and plan their activities. The roll out of smart meters across Great Britain is expected to deliver a positive net present benefit of more than £6 billion over the next 20 years.[52] It is estimated that smart meters will reduce the average household electricity and gas bill by £24 in 2020 and by £39 in 2030.[53]

Non Domestic

The Government has a number of schemes in place to encourage businesses to take up cost-effective energy efficiency measures. These include the **CRC Energy Efficiency Scheme (CRC)**, introduced in April 2010, which requires large users of electricity (e.g. supermarkets, water companies, banks, local authorities and all central government departments) to monitor their energy usage and report on it. These organisations must purchase and surrender allowances to offset their emissions. By 2022 it is expected that the CRC will save a total of 57TWhs.[54]

The **Climate Change Levy (CCL),** introduced by Government in 2001, addresses the barrier of undervaluing energy efficiency by taxing the supply of specified energy products such as electricity, gas and coal for use as fuels (for lighting, heating and power) by business consumers. Good Quality Combined Heat and Power (CHP – see below) is exempt from the levy.

In October 2013 the Government's Mandatory **Greenhouse Gas (GHG) Reporting Scheme** took effect. This new Scheme introduced a mandatory requirement for all UK quoted companies to report on their greenhouse gas emissions, including from energy use. The UK is the first country in the world to make it compulsory for quoted companies to include emissions data for their entire organisation in their annual reports, and this new requirement will enable investors to see which companies are effectively managing the long-term costs of greenhouse gas emissions.

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[52] DECC, *Smart meter roll out for the domestic and small and medium non-domestic sectors (GB): Impact Assessment* (January 2013).

[53] DECC, *Smart meter roll out for the domestic and small and medium non-domestic sectors (GB): Impact Assessment* (January 2013).

[54] Energy saving estimates in this section from Carbon Plan annexes and summarised in UK Government's Article 7 notification: http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_uk_eed_article7_en.pdf

The Government will introduce the **Energy Savings Opportunity Scheme (ESOS)** by June 2014. ESOS will target a gap in the existing policy landscape and help large enterprises to cut their energy costs by providing targeted cost-effective recommendations to improve their energy efficiency. The assessments will review overall energy management practices and all energy use, including energy associated with building fabric, lighting and heating systems. Our current analysis suggests that ESOS has the potential to deliver £1.9 billion of net benefits to the UK and reduce business energy bills by £300 million in its first year.[55]

Various UK and European standards and codes underpin all policy affecting building renovation. Building Regulations set minimum energy efficiency standards whenever certain types of building work are carried out on new and existing buildings. Energy standards have been in place since the 1970's and have been steadily tightened leading to increasingly better standards for insulation, glazing and the efficiency of fixed building services such as heating, cooling, ventilation and lighting.

From April 7th 2014, there has been a further tightening of the energy performance requirements for new non-domestic buildings which has led to an overall increase in energy efficiency of 9% over and above the 2010 requirements for non-domestic buildings. This change in standards is likely to stimulate an increase in the use of building integrated renewable energy on new buildings.

5.3 Market development

Domestic

The Government's policy framework aims to stimulate market development and take up of energy efficiency measures. It does this by removing the need for upfront financing, by overcoming barriers to investment or by offering financial incentives. Implementation of these policies will also provide building owners and users with accurate information about energy efficiency measures specific to their buildings, allowing them to make informed choices when considering renovation.

Launched in January 2013, the **Green Deal** aims to overcome many of the barriers to energy efficient renovation. It provides access to capital and a trustworthy source of advice, assurance and accreditation for the consumer about the energy efficiency supply chain. Green Deal Providers offer consumers energy efficiency improvements to their homes and businesses at no upfront cost, allowing them to pay for upgrades through a charge in instalments on the energy bill.

In December 2013,[56] Government announced plans to refine the Green Deal following feedback from its first year in operation. This will make it more straightforward for householders, as well as stripping out time and cost for industry, while ensuring consumers are properly protected under the scheme.

The supply chain for Green Deal delivery continues to develop and the number of accredited organisations has been increasing steadily since December 2012. At the end of March 2014 there were 364 organisations employing a total of 3,445 Advisors, compared to 108 and 1,003 respectively at the end of March 2013. The number of Green Deal providers has increased to 143 from 48 at the end of March 2013. The number of accredited Installer organisations has increased steadily since the beginning of the year from 831 accredited at the end of March 2013 to 2,575 organisations accredited at the end of March 2014.[57]

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[55] DECC, Energy Saving Opportunities Scheme Consultation Impact Assessment (July 2013).

[56] https://www.gov.uk/government/news/streamlining-and-improving-the-green-deal

[57] https://www.gov.uk/government/publications/green-deal-and-energy-company-obligation-eco-monthly-statistics-march-2014

The Green Deal builds upon the energy efficiency improvements that have been achieved by Government policies in previous decades. Supplier Obligations have been in place in Great Britain since 1994 and have proven to be one of the most successful means of increasing the uptake of energy efficiency measures. Supplier obligations require energy suppliers to meet carbon reduction targets by carrying out insulation works and other energy efficiency measures. Suppliers incentivise their customers to take measures through subsidised offers in order to overcome financial barriers to refurbishment work. The current obligation is the **Energy Company Obligation (ECO).** ECO, introduced at the beginning of 2013, is the largest domestic energy efficiency programme operating across Great Britain. It replaced its predecessor schemes, the Carbon Emissions Reduction Target (CERT), the Community Energy Savings Programme (CESP) and Warm Front schemes.

ECO focuses on lower income households, on households in deprived and rural areas, and on hard-to-treat homes with three distinct elements:

- The Carbon Emissions Reduction Obligation target which provides support for more expensive, less cost-effective energy efficiency measures;
- The Carbon Saving Communities Obligation target which provides insulation measures for those living in low income areas; and
- The Affordable Warmth target (also known as the Home Heating Cost Reduction Obligation) which provides support for heating and insulation measures for the most vulnerable and those more likely to be in fuel poverty.

The Government's proposed changes to ECO[58] will extend it from 2015 to 2017 while maintaining current levels of ambition for the elements of ECO directed at low income and vulnerable households to 2015, and extending them thereafter, at the same scale, to 2017.

The Green Deal and ECO are complementary policy mechanisms. In combination they encourage the take up of more costly energy efficiency measures with longer payback rates than those delivered under previous supplier obligations, in particular solid wall insulation. These policies enable a more market-focussed approach to delivering these measures; competition amongst Green Deal providers is intended to drive higher take up of energy efficiency measures and create a larger, more sustainable market in the longer term.

[58] http://blog.decc.gov.uk/2013/12/04/changes-to-the-green-deal-and-the-energy-company-obligation/

Box 6: Green Deal and ECO Statistics (April 2014)

Activity so far on Green Deal shows the growing market for energy efficiency with increasing interest and participants. A total of 188,234 Green Deal Assessments were carried out by the end of March 2014 up from 163,069 at the end of February 2014. The 25,138 GD Assessments carried out in March 2014 was the highest number lodged in any month to date and 40% higher than the number in February (17,998).

For some, the advice from the assessment encourages them to take action using their own funds, but for those who need financial support they can get a Green Deal Finance Plan. 2,000 households had Green Deal Plans in progress at the end of March 2014, compared to 1,754 at the end of February 2014.

For those on certain benefits, a low income or for certain hard-to-insulate properties energy suppliers can provide funding through ECO. Provisional figures show there were 680,460 measures installed under ECO up to the end of February 2014. Of all ECO measures installed to date, 34% were for cavity wall insulation, 31% were for boiler upgrades and 22% were for loft insulation. All solid wall insulation types accounted for 5%.

59

Other policies build the market for energy efficiency and renewable technologies by offering financial incentives to buyers. The **Feed in Tariff (FIT)** was introduced in April 2010 and pays per unit of electricity generated. A similar scheme for renewable heat; the non-domestic **Renewable Heat Incentive (RHI)** was introduced in November 2011 (the first scheme of its kind in the world). The Government launched a domestic scheme in April 2014. To be eligible for the domestic RHI, all applicants will need to provide evidence that they have identified, through a Green Deal Assessment, which energy efficiency measures would be cost-effective for their property and have, at a minimum, installed loft insulation and cavity wall insulation where these measures are suitable and cost-effective, with an updated EPC as proof (or provide valid evidence proving why installation was not feasible).

Non domestic

For many organisations **Combined Heat and Power (CHP)**, or cogeneration, is the best solution for reducing energy costs. CHP is a process which generates heat and power, usually electricity, at the same time. It is highly efficient as it uses a greater proportion of the input fuel energy, making use of heat which would otherwise be wasted. However, capital costs are high and payback periods can be long. The UK Government has introduced a number of support mechanisms designed to improve the return on investment from CHP.[60] Planning guidance emphasises the benefits of CHP, and Licence Lite[61] provides fair and easy access to the grid for smaller generators through Enhanced Capital Allowances (ECAs) offer tax relief for CHP investment. Renewable CHP is also supported through the Renewables Obligation, RHI and FITs.

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59 https://www.gov.uk/government/publications/green-deal-and-energy-company-obligation-eco-monthly-statistics-march-2014

60 The Future of heating: a strategic framework for low-carbon heat in the UK explains CHP's role in reducing these emissions.] also https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/combined-heat-and-power-chp

61 https://www.london.gov.uk/priorities/environment/tackling-climate-change/energy-supply/licence-lite

5.4 Research and Innovation

Government is investing in research to develop the best technologies and processes to make existing domestic and non-domestic buildings more energy efficient. The **Technology Strategy Board (TSB)** launched its £10 million Invest in Innovative Refurb competition in 2012, through its Small Business Research Initiative programme, which aims to tackle the barriers of embryonic markets which have restricted the number of products in or entering the market, fostered a lack of faith in the benefits of such investment and hampered collaboration between suppliers, designers, building owners and tenants. Contracts were awarded to projects which are developing technologies and processes with the best energy and roll out saving potential.

In March 2013 the Government commissioned the Building Research Establishment (BRE) to run a Solid Wall Insulation Research Project to explore the cost savings achieved by solid wall insulation (SWI) and the extent of heat loss from solid wall properties. The research will enable improved modelling of the energy saving potential of SWI, enhance our understanding of the relative effectiveness of SWI for different types of building, and explore the role of the occupant in realising energy savings. The findings will also support the Green Deal improving the accuracy of Green Deal assessors' calculations of potential savings from SWI, ensuring greater protection for consumers. Realising the potential energy efficiency gains in this area is important if the UK is to meet its domestic carbon targets.

The **Energy Technologies Institute's** (ETI) £100 million, 5 year Smart Systems and Heat Programme is investigating what drives heat demand and the potential for technical innovations to meet this demand more efficiently.

DECC has launched an Energy Entrepreneurs Fund (EEF) to support the development and demonstration of innovative technologies and processes in energy efficiency and building technologies, and in power generation and energy storage. £16 million has been awarded to entrepreneurs since the first phase launch in autumn 2012 and a further £19 million is available until 31 March 2015 to help bring a range of new and innovative low carbon products to market.

The Government ran a non-domestic energy efficiency training competition, awarding grants to 14 winners to increase the capacity of existing training providers to deliver training to individuals with day-to-day responsibility for energy systems. The training raised awareness of the benefits of energy efficiency and the profile of energy management within participants' businesses, accelerated the adoption of new energy efficiency projects, and engaged Board members on the value of energy efficient renovation.

5.5 Policy in the Devolved Governments

The Governments in Scotland, Wales and Northern Ireland have devolved responsibility for aspects of energy policy, including building regulations. The following provides an overview.

Northern Ireland

Northern Ireland's (NI) Strategic Energy Framework (2010), sets out the NI Executive's vision for sustainable energy, including the following on energy efficient renovation.

- Contribute to the UK's energy saving target set by Article 7 of the Energy Efficiency Directive.
- Encourage greater take up of combined heat and power in Northern Ireland.
- Provide appropriate support through Invest: NI for industry to increase productivity by deploying sustainable energy technologies.

Policies distinct from those in the rest of the UK include:

- The Warm Homes Scheme supports approximately 9,000 fuel poor private sector households to make energy efficiency improvements each year.
- The Northern Ireland Sustainable Energy Programme (NISEP) provides around £7.5m per annum in grant funding for energy efficiency and renewable energy schemes for both domestic and non-domestic buildings. 80% of this funding is ring-fenced for schemes that target households at risk of fuel poverty but which do not qualify for the Warm Homes Scheme.
- The Northern Ireland Renewable Heat Incentive (RHI) provides financial support to non-domestic renewable heat generators and producers of bio methane. A Renewable Heat Premium Payment is available for the domestic market.

The Green Deal and ECO do not cover Northern Ireland. The Northern Ireland Government is examining the possibility of an energy efficiency supplier obligation from 2016, subject to legislative provision and a costs and benefits analysis. A Green Deal-style loan and grant support mechanism for energy efficiency improvements, the Household Efficiency and Thermal improvement Programme (HEaT),is currently being piloted . The NI Government has Energy Service Agreements with the majority of NI's energy suppliers to promote and provide energy efficiency services to domestic and small business customers. Additional domestic advice is provided by the Energy Saving Advice service, funded by the Department for Social Development and the Housing Executive.

The Northern Ireland Executive is leading by example by setting energy efficiency/ carbon reduction targets for 2011-2014 under its Energy Efficiency Action Plan (EEAP) for the Government office estate. Further EEAPs are expected for 2014-18.

Scotland

The housing sector is expected to contribute to meeting emissions reductions targets set out in the Climate Change Act (Scotland) 2009 – 42% by 2020, and 80% by 2050. The Government's climate change plan, the 'Report on Proposals and Policies',[62] sets out the current policies and proposed policies to achieve this and the overall reduction in emissions projected for the housing sector is 37% against a 1990 baseline.

In addition, the Scottish Government aims to reduce final energy consumption across all sectors by 12% in 2020 against a baseline averaged over the years 2005 – 2007. This target was set out in the Energy Efficiency Action Plan for Scotland (EEAP) in October 2010 and sits alongside and supports the government's greenhouse gas emissions reduction targets. Scotland is on track to meet this target with a 6.2% fall by 2010 against the baseline. Applying the EU methodology to Scottish figures suggests that, by meeting the Scottish target, the indicative EU target of 20% will also be met.

The Scottish Sustainable Housing Strategy (2013) sets out the route map and vision to 2030 for high-quality, affordable, warm, low-carbon homes. It includes current policies and proposals for future action under four headings: Home Energy Efficiency Programmes for Scotland; the role of Standards; New Build Market Transformation; and Financial Market Transformation.

[62] Low Carbon Scotland: Meeting the Emissions Reductions Targets 2010-2022 (Scottish Government) 2011.

The Sustainable Housing Strategy sets the following milestones for 2020:

- Every home, where cost-effective and technically feasible, to have loft and cavity wall insulation;
- Every home with gas central heating to have a highly efficient boiler with appropriate controls; and;
- At least 100,000 homes to have adopted some form of individual or community renewable heat technology for space and/or water heating.

The Scottish Government is investing £79 million in the **Home Energy Efficiency Programmes for Scotland (HEEPS)** to maximise opportunities to effectively insulate our homes, to help leverage additional funding through the energy supplier obligations (ECO), and to take on the challenge of tackling hard to treat homes which require, for example, solid wall insulation. This programme has shifted the focus to area-based schemes to tackle fuel poverty along with national schemes to provide for the most vulnerable households wherever they live.

In total the Scottish Government is spending around a quarter of a billion pounds over the spending review period to reduce fuel poverty and improve energy efficiency. This work will be done in partnership with energy suppliers, local authorities, housing associations and installers to deliver at least a pro-rata share of the ECO for Scotland.

Energy Standards in Building Regulations

Building regulations are devolved across the four UK administrations. Regulations in Scotland are broadly comparable to those elsewhere in the UK in content, scope and in the levels of improvement delivered over the past decades.

In Scotland, reviews of energy standards in 2002, 2007 and 2010 have reduced emissions by approximately 70% compared to the 1990 baseline, with a commensurate reduction on energy use. Further improvements planned from October 2015 will further reduce levels of delivered energy in new buildings and improve standards applicable to existing buildings.

Since 2007, reviews of energy standards in Scotland have been informed by the recommendations of the Sullivan Report Panel.[63] The panel met in 2013 and made recommendations for post 2015 regulations which are being considered by Scottish Ministers.

Energy Performance of Buildings Directive

Directive 2010/31/EU, the Energy Performance of Buildings Directive (EPBD), applies to the UK as a Member State but is implemented in Scotland by the Scottish Government, with transposition of the Articles of the Directive achieving the same effect as in the rest of the UK. Information on implementation of EPBD in Scotland is published at: www.scotland.gov.uk/epc.

Improving existing non-domestic buildings

Buildings account for around 40% of the carbon emissions in the UK but new buildings account for less than 1% of the overall building stock each year. Emissions reductions will therefore take effect very slowly through new-build. Under Section 63, 'Energy Performance of Non-Domestic Buildings' of the Climate Change (Scotland) Act 2009 (Section 63 CCSA) there is a duty on Scottish Ministers to require:

- Assessment of the energy performance of non-domestic buildings and emissions produced; and
- Owners of such buildings to improve the energy performance and reduce emissions.

[63] See www.scotland.gov.uk/sullivanreport

This will make a significant contribution to improving the energy efficiency of the total building stock. Regulations and guidance to implement S63 CCSA will be ready by late 2014 and will take account of the need to for industry to train additional assessors and build capacity.

Large buildings at the point of sale or new lease will be within the scope of the regulations, with the exception of Green Deal properties or those which comply with recent building standards (Building Standards (Scotland) Amendment Regulations 2001).

Building owners will be required to carry out physical improvements to their buildings. Some may opt for an operational ratings system, but this system may be discontinued.

As this is the first set of regulations for Section 63 CCSA, stakeholders were again consulted in spring 2013 and the Scottish Government is now preparing its response.

Wales

The Welsh Government's Climate Change Strategy (2010) set a 3% per annum target reduction in greenhouse gas emissions in areas of devolved competency, leading to a total reduction of 40% in greenhouse gas emissions by 2020 against a 1990 baseline. The strategy specified target emissions reduction 'ranges' for each sector to which the target applied (transport, domestic, business, agriculture, public sector and waste), . The Welsh Government has introduced a suite of policies and programmes to meet these targets, notably the National Energy Efficiency and Savings Plan (2011) and the Fuel Poverty Strategy (2010).

The policy focus of the Welsh Government is primarily on expenditure on retrofit programmes to address fuel poverty, enhanced planning policy/building regulations and support for the supply chain.

Its programme includes Nest, a £20m per annum fuel poverty programme that provides energy efficiency advice and income maximisation advice, alongside installation of 'whole house' measures, for qualifying properties. Nest focuses spend on the households on the lowest incomes and in the most inefficient properties, on a house-by-house basis. Nest provides approximately 5000 households a year with a package of energy efficiency improvements. Alongside Nest, Arbed is the area-based 'whole house' retrofit programme, with Arbed Phase 2 retrofitting over 4,500 homes across Wales in 2012-15. The Welsh Government has also made available an additional £80m to leverage investment from the energy company obligation (ECO).

Building regulations were devolved in 2011, enabling the Welsh Government to consult on and amend Part L. These amendments set a higher level of energy performance for new and existing buildings from 2014, with a review in 2016. This continues a pre-devolution policy trend which set more stringent buildings regulations for energy performance in Wales than those in England or Scotland.

From autumn 2014 the Welsh Government will provide integrated resource efficiency support services for the domestic, community and public sectors; and will strengthen its support for business through Business Wales.

Chapter 6: Forward guidance for investment

6.1 Introduction

Although the pathway to delivering improved energy efficiency is increasingly clear, it will need significant levels of investment from individuals, the construction industry and financial institutions. The Government is working to improve access to finance and catalyse the market for building renovation.

The UK has long been a leader on climate change and the introduction of the Climate Change Act 2008 and its commitment to cut greenhouse gas emissions by 80% by 2050 is a model that has since been replicated in a number of countries. Building renovation will play a major role in meeting this target: by 2050 all buildings will need to have an emissions footprint close to zero.

The UK Government is committed to implementing the EU Energy Efficiency Directive (2012/27/EU) – see box 7 below – and meeting its targets to:

- Reduce final energy consumption by 18% in 2020, compared to a 2007 baseline (Article 3)[64]
- Achieve cumulative final energy savings of 1.5% annually through the deployment of a supplier obligation and/or equivalent policy.

[64] See https://www.gov.uk/government/publications/energy-efficiency-strategy-2013-update

Box 7: Targets and Aspirations Explained[65]

EU energy efficiency target

In 2007 EU Member States agreed a non-binding target to reduce primary energy consumption by 20% by 2020, against a 2007 business-as-usual projection. This forms part of a wider package of targets – known as the "20-20-20 targets" – which make up the EU's 2020 climate and energy package, which includes binding greenhouse gas emissions and renewable energy targets.

EU Energy Efficiency Directive

The EU Energy Efficiency Directive (2012/27/EU) represents a major step forward for energy efficiency in the UK, establishing a common framework of measures to promote energy efficiency across different sectors of the economy throughout the EU.

The Directive introduced two new targets for Member States:

- A non-binding national energy efficiency target for 2020, to be set by Member States taking into account the EU's overarching non-binding 2020 energy efficiency target (Article 3).
- A legally binding target to save 1.5% of final energy annually, year on year (Article 7).

DECC's Energy Efficiency Deployment Office's (EEDO) ambition for improving energy efficiency

The *Energy Efficiency Strategy* set out the ambition for EEDO, delivering energy demand reduction beyond that which existing energy efficiency policies are projected to deliver. We remain committed to securing permanent energy reductions and ensuring the successful delivery of our policies. The 2013 *Energy and Emissions Projections* suggest that existing policy measures will reduce final energy demand by 154 TWh in 2020. New policies, such as the Energy Saving Opportunity Scheme (ESOS), should help deliver energy savings beyond this level.

The Carbon Plan[66] outlines the role that building renovation needs to play in each carbon budget period and the suite of policies described in Chapter 4 of this report will drive the necessary energy efficient renovation activity. The Carbon Plan also recognises the important role of building renovation in each of the four different emissions scenarios to deliver against 2050 targets. Over the next decade, Green Deal, Smart Metering and ECO will be the key drivers of energy efficiency renovation in the domestic sector, and the Climate Change Agreements, the CRC Energy Efficiency Scheme and ESOS will be the key drivers for energy efficiency renovation in the non-domestic sector. During the 2020s, the deployment of solid wall insulation will increase in the domestic sector and low carbon heat will start to be deployed widely in the domestic and non-domestic sectors. The 2013 Energy and Emission Projections show that the UK is on track to meet its projected savings for the 3rd carbon budget by 2022.[67]

[65] https://www.gov.uk/government/publications/energy-efficiency-strategy-2013-update

[66] The Carbon Plan: Delivering our low carbon future (2011). DECC.

[67] Updated Energy and Emissions Projections (2013). DECC.

Box 8: Carbon Budgets

	Date	Carbon budget level million tonnes carbon dioxide equivalent $MtCO_2e$	Percentage reduction below base year
1st carbon budget	2008–2012	3,018	23%
2nd carbon budget	2013–2017	2,782	29%
3rd carbon budget	2018–2022	2,544	35%
4th carbon budget	2023–2027	1,950	50%

6.2 Existing Programmes and Sources of Funding

Owners' private equity

Domestic

Research undertaken in 2011 for the Office of Fair Trading reported that consumers spend around £27 billion every year on home improvements, maintenance and repairs.

The third wave of DECC's Green Deal Assessments tracker survey found that as following a Green Deal assessment, 81% of households intended to, or had already, installed at least one recommended measure. When asked how they had paid for measures, 11% said they used savings and regular income. Of those who said they would definitely/probably install measures in the future, 25% expected to pay for them from their own savings/regular income.

Non-Domestic

In the non-domestic market, the UK Energy Performance Contracting market has an estimated value of around £180 million.[68]

Larger organisations will typically have easier access to finance, either from cash reserves or borrowing, and have greater competencies in the area of financing capital projects. This market will also attract Energy Service Companies (ESCOs) or Energy Performance Contractors (EPC), who concentrate on projects sufficiently large to achieve economies of scale. For smaller organisations, financing projects outside their core business area is more challenging and they are less attractive to ESCO-type organisations. Many large retail organisations self-fund energy efficiency measures because they are both building owner and occupier, have a strong cash position and are more engaged in energy efficiency – often in response to corporate targets and Corporate Social Responsibility reporting requirements.

The UK's large commercial office market is less engaged in energy efficiency than in some other countries, such as Australia, where landlords compete to make their buildings more energy efficient than their competitors'. ESCO activity in this market is also limited because of split incentives between tenants and landlords. Nevertheless, some landlords are starting to see the value of making their buildings' common areas more energy efficient. These projects are typically financed by the landlord and recovered through tenant service charges. Models are starting to emerge, such as Green Leases (see box 9 below), which address split incentives. These are managed energy service agreements whereby tenants sign up to energy management contracts that benefit them and are financed by them. Organisations such as the Better Buildings Partnership[69] are seeking to overcome these barriers.

[68] http://www.energyperformancehub.com/2013/05/30/five-biggest-barriers-to-energy-performance-contracts-uptake/

[69] http://www.betterbuildingspartnership.co.uk/media/case-studies/

Box 9: Growth in the Commercial Energy Services Market, Marks and Spencer's Green Lease Policy

Marks & Spencer (M&S) unveiled a new property lease policy – the 'Green Lease Policy' – at Ecobuild in March 2013. As part of a new lease, all new M&S stores will have 'green' clauses as standard, enabling landlords and tenants to better manage a building's environmental performance.

M&S also reached an agreement with the Better Buildings Partnership (a collaboration of the UK's major landlords working to improve the sustainability of existing commercial building stock) to introduce green clauses, by means of a Memorandum of Understanding to sit alongside the leases of existing M&S stores. The project will encompass 70 agreements at sites across the UK owned by British Land, Canary Wharf Group, Hammerson, Hermes Real Estate, Henderson Global Investors, Land Securities, LaSalle Investment Management, Legal & General Property and M&G Real Estate.

The provision of green clauses, whether in new leases or signed memorandum agreements, will assist M&S and its landlords to better manage a building's environmental performance. The clauses facilitate the sharing of waste information and data such as gas, electricity and water usage in M&S occupied buildings, to encourage both landlord and tenant to make significant carbon reductions. It also encourages a joint approach to investment 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 (against a 2007 baseline). M&S has already achieved a 28% reduction but wants to go further.

Energy intensive organisations, such as data centres and industrial plants, are increasingly focusing on energy efficiency, as energy costs become a greater proportion of their operating costs. The increasing use of cloud computing means that office-based businesses are shifting electricity consumption from in-house server rooms to external data centres. As energy usage patterns in data centres tend to be steady, the return on investment from energy efficiency measures can be very quick and therefore attractive for both self-finance and for ESCO or EPCs.

The challenge for manufacturing and industrial plants is generally more complex as these process-dominated facilities are capital intensive and it can be hard for them to self-fund energy efficiency measures for all but the shortest payback periods (typically less than 3 years). ESCO/EPC deals are possible, but rare, due to the complex challenge of agreeing a baseline to compare future performance against when production volumes are constantly changing in response to market demand. External financing of measures is possible but is typically associated with a high capital cost due to the relatively high risk of business failure and default compared to the public sector or commercial property.

Public expenditure

In October 2012 the Government established the UK Green Investment Bank (GIB), which invests in UK projects which are both green and commercial, and where its capital is additional to available private sector finance. The GIB has a mandate to invest at least 80% of its capital in three priority sectors – energy efficiency, off-shore wind and waste. To date, the Bank has committed £150 million to specialist energy efficiency funds: £50 million each to Sustainable Development Capital and Equitix to make smaller scale non-domestic energy efficiency investments; and £50 million to a fund operated by Aviva to invest in the construction of energy

centres for hospitals. A full list of the GIB's investments (including in areas other than energy efficiency) to date, and details of leveraged funding and expected carbon savings, can be found in their annual report.[70]

A group of private sector investors is collaborating with DECC and the GIB, investing in the Green Deal Finance Company (GDFC).[71] The GDFC is a not-for-profit entity which offers finance in support of Green Deal at the lowest interest rates possible. Section 5 of this report details additional financial support available through ECO, and early adoption incentives, such as Green Deal cash back and the £88 million Green Deal Communities fund, that have been made available to establish the market for Green Deal-led home renovation. Funding has been provided to support the supply chain in training installers; to set up and operate a consumer advice service (the Energy Saving Advice Service); and to establish an Oversight and Registration Body and Ombudsman for Green Deal and ECO related issues.

From April 2014, the RHI scheme became available to domestic customers. A forerunner scheme, the Renewable Heat Premium Payment, was in operation for a number of years and includes a requirement to make energy efficiency improvements before payments could be claimed. £424 million has been allocated for the domestic and non-domestic RHI in 2014-15 and £446 million has been allocated in 2014-15 for Feed in Tariff payments for electricity generated by small scale renewable energy installations. Households must meet minimum energy performance standards to qualify for these schemes.

In 2010, the Government introduced the Greening Government Commitments which, alongside other targets, require a 25% reduction in greenhouse gas emissions from the central government estate by 2015 (against a 2009-10 baseline). In December 2013 the Government's 2012-13 Greening Government Commitments annual report[72] recorded an overall emissions reduction of 14%. Savings achieved after 1 January 2014 will contribute to UK targets under Article 5 of the EU Energy Efficiency Directive, which requires Member States to demonstrate leadership on energy efficiency by either renovating 3% of the total floor area of heated or cooled buildings in the Central Government estate that do not meet minimum energy performance requirements, or take alternative measures to achieve an equivalent energy saving.

In 2004 the Salix Finance public sector energy efficiency loan scheme was established to provide public sector organisations with interest free loans for energy efficiency projects. Salix Finance Ltd is an independent, not-for-profit company, funded by DECC and the Welsh and Scottish Governments. Salix has funded over 11,000 projects with 794 public sector bodies, valued at £272.8 million.[73] An additional £18 million was provided for Salix loans in 2012-13, £8m of which was ring-fenced for schools. In December 2013 the Government announced a further £90 million for Salix over the next three years to provide loans to improve the energy efficiency of hospitals, schools, and other public sector buildings, building on the Salix scheme.

In its Energy Efficiency Strategy, DECC committed to rolling out the RE:FIT scheme, established by the Greater London Authority, throughout England,. The scheme gives the public sector access to the ESCO market. Initial funding is being delivered through Local Partnerships, supporting 50 public sector energy efficiency projects in 2013-14 and 2014-15. In the seven months to December 2013, 60 projects had registered funding. DECC anticipates that the RE:FIT roll out will be self-financing.

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[70] http://www.greeninvestmentbank.com/userfiles/files/GIB-Annual-Report-2013.pdf

[71] http://www.tgdfc.org/about-gdfc

[72] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266690/pb14107-greening-gov-commitments-2013.pdf

[73] http://salixfinance.co.uk/about-us

DECC is funding a £20 million Electricity Demand Reduction pilot, which is expected to launch in summer 2014. The pilot is expected to last two years and will test the use of financial incentives for businesses and other organisations which install measures, such as more efficient motors, air conditioning and lighting, to reduce their electricity use.

DECC is working with the Technology Strategy Board on research into future energy efficiency renovation technologies, including the Invest in Innovative Refurb competition, launched in 2012. The £10m Small Business Research Initiative programme will address the lack of product and systems innovation in non-domestic buildings. Progress on improving the energy efficiency of non-domestic buildings has been hampered by a limited number of products in or entering the market, a lack of faith in the benefits of such an investment and a lack of collaboration between suppliers, designers, building owners and tenants. The Energy Technologies Institute's (ETI) £100 million, 5 year Smart Systems and Heat Programme has the capability to design, deliver and evaluate new heat technologies; has begun to build key partnerships with Local Authorities around the UK; and has initiated research to understand what drives heat demand, as well as the potential for technical innovations to meet these demands in better ways. DECC will continue to collaborate closely with the ETI to harvest insights from the programme and to build synergy in areas of mutual interest, including the potential for 'smarter' heating controls to reduce energy use.

The Energy Entrepreneurs Fund, worth £35 million, is supporting 31 companies to develop innovative technologies within the energy efficiency, building technologies, power generation and energy storage sectors. The first phase awarded grants of £16 million to 31 companies, two thirds of whom are developing energy efficiency products.

EU Structural and Innovation Funds

In 2013 the European Commission review the source of funds and financing for energy efficiency in buildings.[74] The main sources of funds in Europe from 2007-2013 are shown in table 6. The final column shows the proportion of each dedicated to energy efficiency.

Table 6: Funding for energy efficiency across Europe from 2007–2013

Funding Source	Instruments/mechanisms	Total funding available	Funding for EE
Cohesion Policy Funding	Operational Programmes including financial instruments (e.g. JESSICA)	€10.1 billion planned for sustainable energy (RES & EE)	€5.5 billion planned for EE, co-generation and energy management
Research Funding	FP 7 (e.g. Concerto, E2B PPP, Smart Cities)	€2.35 billion for Energy research	€290 million for energy efficiency
Enlargement Policy Funding	IFI facilities (SMEFF, MFF, EEFF)	€552.3 million (381,5 +117,8+53 respectively)	About one third of total funding for projects in industry and buildings
Programme for European Energy Recovery (EEPR)	European Energy Efficiency Fund (EEEF)	€265 million	70% of funding to be dedicated to energy efficiency
Competitiveness and Innovation Funding (CIP)	Intelligent Energy Europe Programme (including ELENA) Information and Communication Technologies Policy Support Programme (ICT PSP)	Approximately €730 million for each programme	About 50% of the funding was dedicated to energy efficiency in all sectors

UK local authorities have benefitted from these funds. Birmingham City Council used ELENA funding[75] for the Birmingham Energy Saver scheme; Newcastle City Council used Intelligent Energy Europe (Mobilising local Energy Investment) funds for its WarmUpNorth programme;[76] and London used JESSICA funding for its public sector building RE:FIT programme.[77]

The proportion of total EU funding, including the European Regional Development Fund (EDRF), allocated to low carbon and energy efficiency spending will increase to 20% in 2014-2020 in the most developed regions, up from 4% in the previous spending period.. In the UK, EU funding will be overseen by Local Enterprise Partnerships (LEPs), and each LEP must demonstrate they are addressing EU low-carbon priorities. Central guidance has been issued to all LEPs[78] and centralised funding mechanisms for energy efficient renovation (known as opt-in schemes), available to all LEPs, have been established.[79] LEPs have been invited to use these instruments to invest a proportion of their ERDF allocation, giving them access to low interest, long term lending for low carbon investment in retrofitting social housing. LEPs are required[80] to focus investment on projects which will meet the UK's energy efficiency targets, create jobs and growth in low carbon technologies, help reduce greenhouse gas emission reductions, and promote decentralised renewable energy production. LEPs submitted draft plans in 2013 which are being assessed.

[74] http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm

[75] http://www.eib.org/about/press/2012/2012-095-pound1-3m-european-backing-for-birmingham-energy-saving-programme.htm

[76] http://warmupnorth.com/iee-funding-programme/

[77] http://www.refit.org.uk/what-refit/funding-refit-projects/leef/

[78] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224755/13-1049-development-and-delivery-european-and-investment-fund-strategies-guidance-for-leps.pdf

[79] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232307/13-1049ann2-framework-of-european-groth-prgoramme-priorities-opt-in-prospectuses.pdf

[80] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232306/13-1049ann-framework-of-european-growth-programme-priorities.pdf

Banks and other sources of private investment

The European Commission review of funds and financing for improving energy efficiency in buildings[81] noted that:

> *"The private sector provides the majority of financing for energy efficiency projects in buildings. Next to building owners and occupiers who invest in upgrading their properties and homes, commercial banks are also showing interest in this sector even though the level of commercial financing is still relatively low.*
>
> *However, as a result of the large number of relatively small-scale and widely differing size of investments by private property owners, there is no comprehensive overview of the funds being allocated to energy efficiency improvements in buildings. Although investments tend to be larger in the non-residential sector, also here robust data about the scale of investments into energy efficiency are absent".*

The UK-based Institutional Investors Group on Climate Change's property working group has examined the challenges of funding more energy efficient buildings,[82] adaptation and resilience. The Climate Bonds Initiative plans to certify energy efficiency bonds[83] and DECC is collaborating with private sector investors on Green Deal and ECO finance, and is continuing to support the growth of the green bond market.

6.3 Wider benefits of renovation

UK energy policy has three overarching aims: reduce the cost of energy to consumers, increase the security of our energy supply and make the transition to low carbon energy. This section has focused on financial support and the financial case for energy efficient buildings but there are many wider benefits of energy efficient renovation beyond energy savings (see box 10 below).

[81] http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm

[82] http://www.iigcc.org/programmes/programme/property

[83] http://www.climatebonds.net/wp-content/uploads/2012/07/Energy-Efficiency-Working-Group.pdf

Box 10: Wider Benefits of Energy Efficient Renovation

Reduce costs to energy consumers. As demonstrated elsewhere in this report, the installation of energy efficiency measures with short payback periods can deliver significant energy bill savings in homes. Businesses can save up to 10% on their energy costs through improved operational energy management. Energy costs can represent between 1-10% of operational costs for the average business and some have warned that rising energy costs present serious risks to their future profitability, or even survival. The energy efficiency policies outlined here will help businesses make energy efficiency improvements and reduce energy use.

Reduce fuel poverty by tackling the hard to treat properties that often give rise to fuel poverty.

Increase energy security, by reducing demand for energy, in particular gas, and diversifying supply into decentralised renewable generation. This has clear benefits for the UK in terms of meeting our strategic goals of increased energy security and reducing our reliance on fossil fuel imports.

Expanding markets for energy efficiency and renewable energy technologies worldwide is a significant opportunity for the UK. Global growth in green and sustainable building construction is forecast to be, on average, more than 22%, per year, in 2012-2017. Developing the retrofit supply chain will generate employment opportunities, and act as an export market for UK manufacturing and expertise.

Develop skills and supply chains. The Government has made £3.5 million available to fund training programmes for Green Deal assessors and solid wall insulation installers. The Government and industry recently published a joint strategy, *Construction 2025: strategy*, which set out the vision for where the UK construction industry will be in 2025. At the heart of this is a sustainable, efficient, and technologically advanced industry that leads the way in low-carbon and green construction exports.

Improved Health. Energy efficient renovation provides health benefits, by improving the thermal comfort of properties and reducing cold related and respiratory illnesses.

Annex B (i): A detailed statistical overview of the United Kingdom's building stock

This section gives a more detailed statistical overview of the main features of the the building stock in the UK that affect opportunities for renovation.

7.1 Building Types

The UK building stock varies widely both in age and type. The stock has proved to be extremely adaptable over time as changes to social and employment patterns have shifted the demand for different building uses. Historic industrial building types like wharf buildings and woollen mills have been converted for use as flats, offices, and retail and community premises. City centre Victorian and Georgian residential terraces have been horizontally and vertically split and re-combined many times to suit a variety of commercial uses. This presents both challenges and opportunities for energy efficient renovation.

Profile of domestic building types

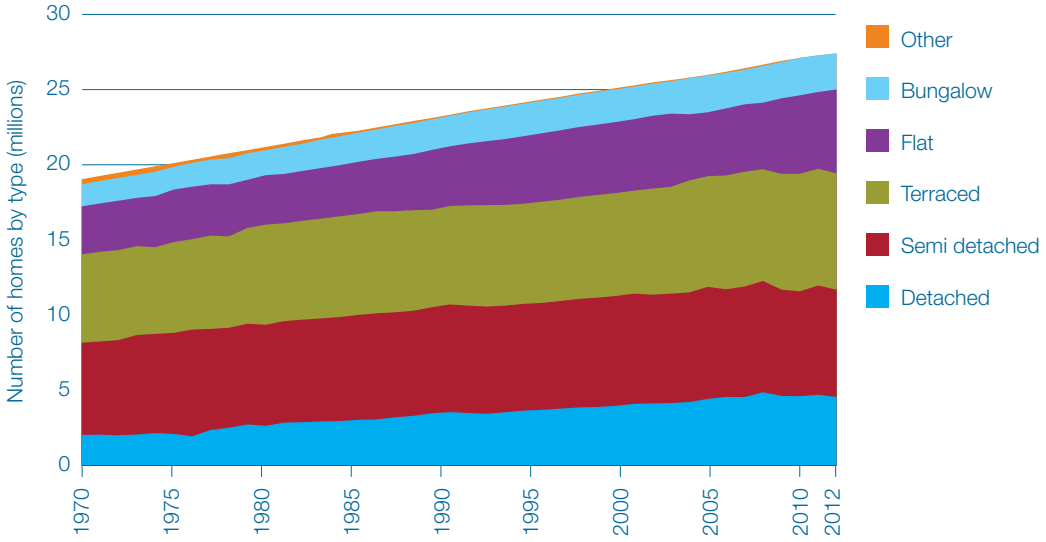
Dwellings are categorised as detached houses, semi-detached houses, terraced houses, flats or bungalows. This is significant in energy terms because the amount of energy required to heat internal spaces relates closely to the area of floors, walls, roofs and windows. Flats tend to have less external area compared to their floor area (so have less heat loss in winter), while detached houses typically have a greater exposed external area than equivalent sized homes of other types.

Semi-detached and terraced houses are the most common house types, making up 57% of UK homes. Over the last 40 years there has been a pronounced change in stock proportions with an increase in the number of flats and detached houses which now represent 20% and 17% of the English housing stock respectively.[84] The proportion of flats is greater in Scotland (36%). Wales and Northern Ireland, as comparatively rural countries, have fewer flats (8% in both Wales and Northern Ireland) and more detached homes (around 30% in both countries).

The proportion of flats in the UK is the lowest in Europe with the exception of Ireland and Norway. The stock of older housing has increased since 2000 due to the subdivision of single dwellings into flats.

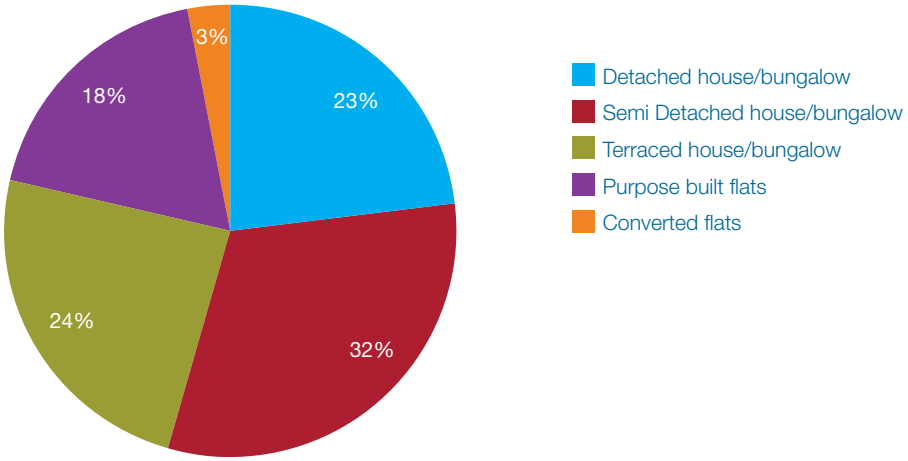
[84] DECC, *United Kingdom housing energy fact file*, 2013.

Figure 11: Number of homes by type in England 1970-2012



Source: Analysis based on English Housing Survey[85]

Figure 12: Domestic building categories within UK 2011



Source: UK Census 2011

Different regions and countries in the UK have some distinct build forms. For example in the North East of England "Tyneside flats" are prevalent – nineteenth century properties consisting of pairs of purpose built single-storey flats within a two-storey terrace. In Scotland's main cities, historic tenement blocks of purpose built apartments are quite common. Some of these date back to the 18th century, representing a rich part of the architectural heritage within the local area.

Profile of non-domestic building types

There are over 1.8 million non-domestic premises in the UK, which are responsible for around 17% of total UK energy consumption[86] and use around 220 TWh of energy a year.[87] These buildings are made up of many different building types, ages and use profiles, from small shops to high rise commercial office buildings, to hospitals and airports (see Box 11).

[85] DECC, *United Kingdom housing energy fact file*, 2013 Note 'Other' category consists of all those types of dwellings that do not fit into any standard dwelling type, such as temporary dwellings.

[86] DECC *The Future of Heating: Meeting the Challenge*, March 2013

[87] Analysis based on Energy Consumption in the UK table 1.07, 2012

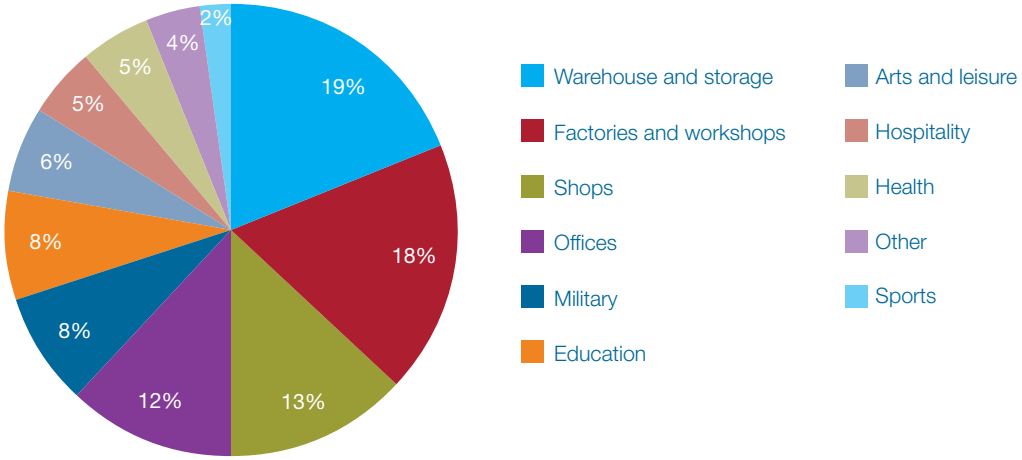
Relatively little data is available on non-domestic building stock types and energy performance. From the data that exists, however, it seems that there is some relationship between activity and built form, despite the diversity across the non-domestic stock.[88]

Energy performance varies widely within the non-domestic sector, even for very similar buildings. It is common to see a five- or tenfold difference in energy intensity per square meter between the lowest and the highest consumption buildings within a particular sub-sector.[89] Part of this variation will be due to differences in the building efficiency.

The Government has identified that significant savings could be achieved through socially cost-effective investment in energy efficiency. We are continuing to develop solutions, such as the Green Deal and the Smart Meter roll out, which will help the UK realise more of its cost-effective energy efficiency potential – a key strategic aim of the government, as set out in the Energy Efficiency Strategy. Further detail on this is provided in Section 4.

Cost-effective approaches to energy efficiency

Figure 13: Proportion of UK non-domestic building categories[90] by floor area



Source: UCL Carbon Reductions in Buildings (CaRB) stock model (v2), 2010

[88] BRE, *Non-Domestic Energy Factfile*, 1998

[89] University College London, *An Analysis of Display Energy Certificates for Public Buildings, 2008 to 2012*, A Report to the Chartered Institution of Building Services Engineers, Energy Institute, Sung-Min Hong and Philip Steadman, October 2013

[90] Other includes community/civil/waste disposal, agriculture, countryside, transport and miscellaneous

Box 11: Non-domestic building categories

Non-domestic buildings in the UK can be categorised as follows:

- Offices: range includes small business units, to conference centres, to large multi-tenant commercial office buildings
- Shops: from sales kiosks, small high street shops, and post offices, to supermarkets and department stores, to retail warehouses
- Factories and workshops: from small workshops, to major industrial complexes, vehicle manufacturing and iron/steel works
- Warehouses and storage: includes cold stores, storage depots and distribution warehouses
- Hospitality: wine bars, takeaways, guesthouses, public houses, cafes, restaurants, caravan parks, hotels and resorts
- Arts and leisure: museums and art galleries, to nightclubs, cinemas and theatres
- Sports: from tennis centres and sports grounds, to snooker clubs and bingo halls, to swimming pools and leisure centres
- Education: from crèches and nurseries to schools, colleges, and universities
- Health: from surgeries and clinics, to health centres, to general acute hospitals
- Transport: from garages and under-cover car parks, to lorry parking, bus depots and air and rail transport hubs
- Community: from hostels and nursing homes , to village halls and community centres
- Emergency services/ Courts/ Detention: as well as police, fire, ambulance and lifeboat stations, it includes law courts, young offenders institutions and prisons
- Agriculture, countryside: from garden centres, to farm shops, to specialist farms and agricultural produce pack houses
- Military: forces careers offices, Territorial Army centres, cadet centres, MoD military and administrative sites

7.2 Building age

Profile of domestic building age

The UK has 27 million homes[91] across a wide range of housing types, including a significant proportion of older buildings, as shown in Figure 14. Based on current construction and demolition rates, over two thirds of the homes that will exist in the UK in 2050 have already been built.[92]

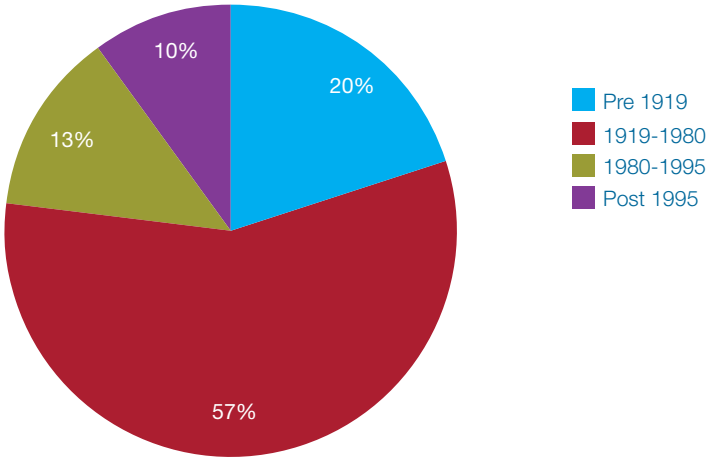
Energy conservation measures were first introduced in non-domestic buildings in 1974, with the current system of Building Regulations in England coming into force in 1985, which included Part L, the 'conservation of fuel and power' which has been regularly updated. Building regulations are currently devolved in all four UK Administrations.

[91] DECC, *United Kingdom housing energy fact file, 2013*

[92] Carbon Trust, *Building the future today*, 2009

Despite the early introduction of energy efficiency requirements in Building Regulations, substantial energy efficiency potential remains in the UK due to the age of its housing stock. Though most of the cheaper insulation measures have now been fitted, there remains cost-effective energy efficiency potential in the UK's building stock.

Figure 14: Age profile of UK housing[93]



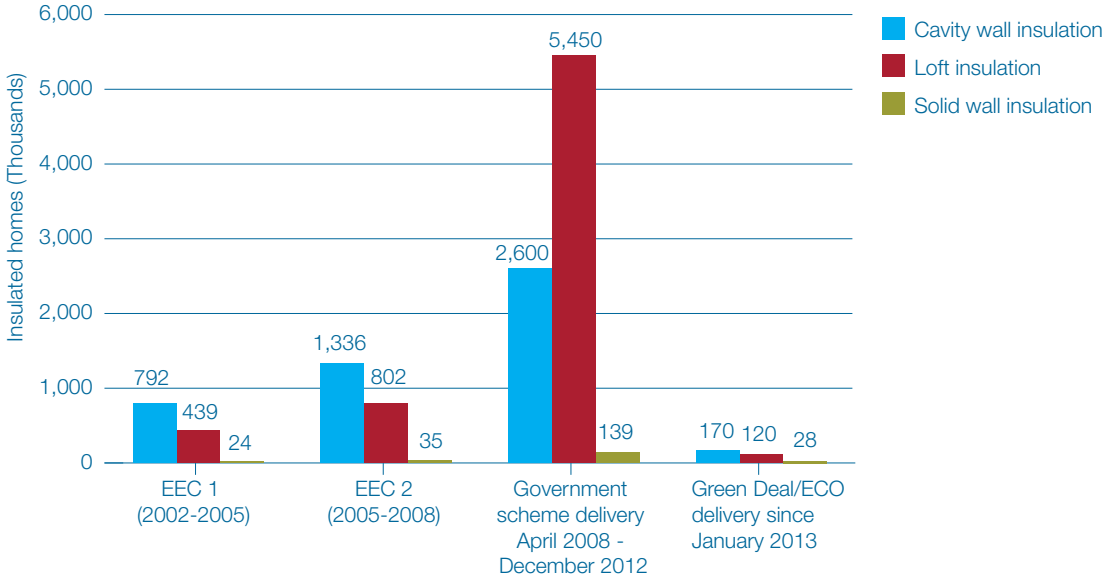
Source: Housing Surveys

The prevalence of older buildings in the national stock built to lower standards of energy efficiency leaves a considerable legacy of non-energy efficient features. Older homes typically have no, or lower quality insulation than more modern homes and if they have solid walls, they are more difficult to bring up to modern standards of insulation.

However, Building Regulations and legacy energy company obligations have been effective in raising standards of insulation. The Energy Efficiency Commitments (EEC1&2 2002-2008) and other government schemes including the Carbon Emissions Reduction Target (CERT 2008-2012) led to large numbers of improvements in terms of loft and cavity wall insulation. Figure 15 shows the number of insulation measures installed under these two initiatives up to December 2013.

[93] Source: English housing survey 2011, Living in wales survey 2008, Northern Ireland Housing Condition Survey 2011 and Scottish House Condition Survey 2009. For Scotland the date ranges are post 1997, 1982-1997, 1919-1981 and Pre 1919.

Figure 15: Insulation measures installed under previous policies



Sources: Ofgem 2005, 2008 and DECC 2014[94]

While most of the twentieth century cavity walled homes have been insulated, there are 5.1 million un-insulated or partially insulated cavity wall homes. Only 700,000 of them were classed as easy to treat standard cavities, but the works are still typically cost-effective given the significant energy savings that result. The outstanding cost-effective potential is discussed in section 4.

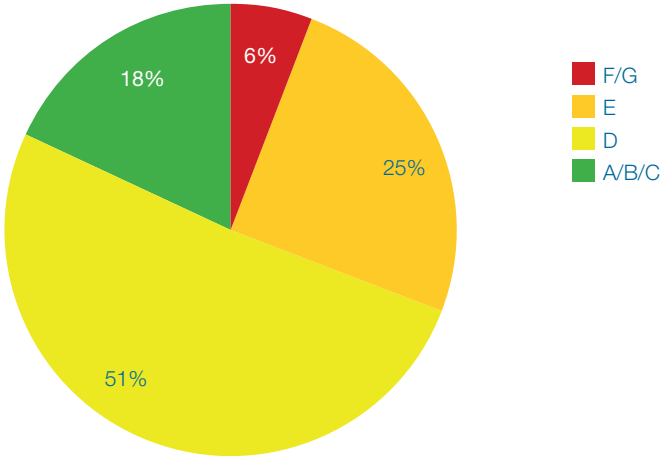
About 7 million homes in the UK have solid walls, particularly those built before 1919. Insulating the existing stock of solid wall homes is a key strategic aim for the UK government and will be crucial if we are to meet our domestic carbon targets. In March 2013, the government contracted the Building Research Establishment (BRE) to run a Solid Wall Insulation Research Project, which is aimed at improving our understanding of the cost-effectiveness of solid wall insulation, and heat losses from solid wall properties.[95] The project will support the delivery of Green Deal as the outputs will help improve Green Deal assessors' prediction of savings from solid wall insulation, ensuring greater protection for consumers.

In England, approximately half the homes have an EPC rating of D (see Figure 16), a further 25% are rated E, and 6% of homes are F or G rated. Scotland has a lower proportion of the least efficient housing with 4% rated F or G.

[94] Ofgem, *A review of the Energy Efficiency commitment 2002-2005* (2005); Ofgem, *A review of the Energy Efficiency Commitment 2005-2008* (2008); DECC, *Green Deal, Energy Company Obligation (ECO) and Insulation Levels in Great Britain, Quarterly report: to December 2013,* (2014)

[95] DECC, *Estimates of Home Insulation Levels in Great Britain up to December 2013*.

Figure 16: Energy efficiency rating of English housing stock, 2012



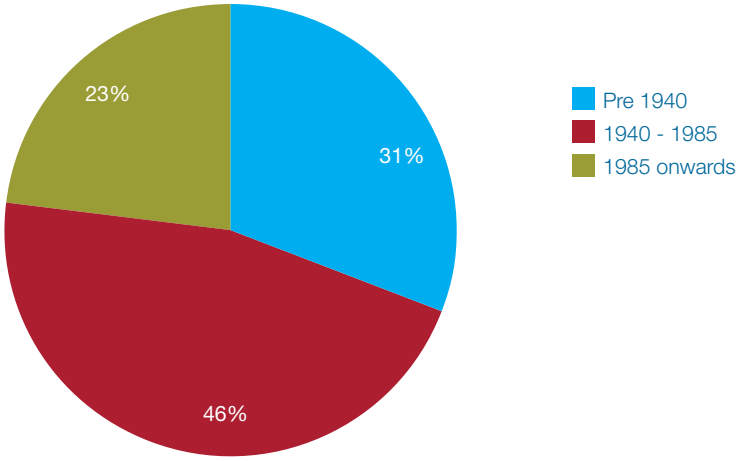
Source: English Housing Survey 2012

Profile of non-domestic building age

Non-domestic buildings in the UK span a wide range of ages (see Figure 17). More than three quarters of the UK's non-domestic buildings were built before 1985, and nearly a third were built before 1940. The majority of the UK's non-domestic building stock therefore pre-dates any energy conservation measures required under Building Regulations.[96] By 2050, half of these buildings will still be in use.[97]

Some non-domestic building energy uses, such as lighting, will have a relationship with building age through the refurbishment of buildings.

Figure 17: Age of non-domestic buildings by build period



Source: Building Research Establishment[98]

[96] NOTE: where significant refurbishment has taken place, improvements in the energy efficiency may have been implemented, as required by Building Regulations

[97] Carbon Trust, *Building the future, today,* 2009

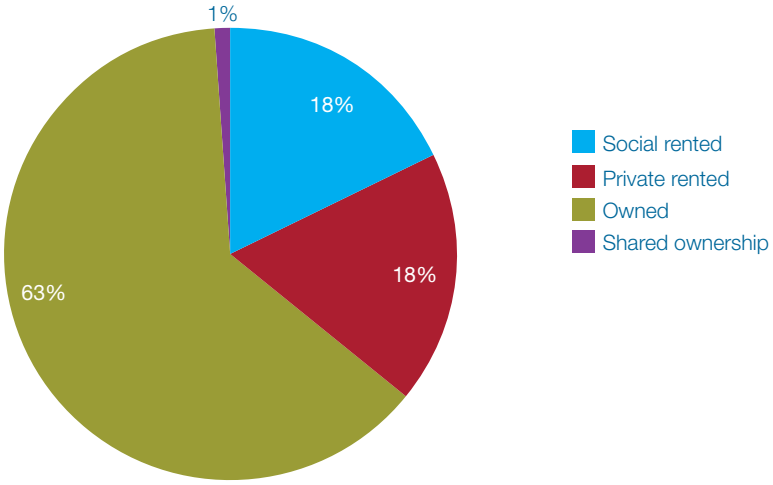
[98] Building the Future, Today – Transforming the Economic and Carbon Performance of the Buildings We Work In, Carbon Trust, 2009

7.3 Building tenure

Domestic building tenure

In 2011, around two-thirds (63%) of homes in the UK were owner occupied[99] and recent years have seen a rapid growth in the private rented sector which accounts for 18% of homes in the UK (See Figure 18). Private renting is highest in England where 18% of households are now private tenants; whilst in Scotland and Wales this figure is around 14%. There has been a decline in the number of socially rented homes, which are provided by housing associations[100] or local authorities. However at 18%, the UK still has some of the highest levels of social housing in Europe and rates are much higher in Scotland.[101]

Figure 18: Tenure of households in the UK



Source: 2011 UK Census

The level of owner occupation has implications for policy design. Owner occupiers benefit directly from energy efficiency upgrades, whereas landlords may pay for improvements while their tenants benefit from lower bills. The government's 2012 Energy Efficiency Strategy recognises this financial misalignment, also known as the 'split incentive problem' and details key policies to tackle it, such as the Green Deal which allows landlords to share the costs of measures with the tenants (in England, Scotland and Wales). This arrangement is dependent on there being no net or upfront costs to landlords. Further, the Government took powers in the Energy Act 2011 to regulate to ensure private landlords make cost-effective energy efficiency upgrades (in England and Wales).

The least efficient homes are in the private sector, with owner occupied homes and private rented homes having near identical average energy performance ratings.[102] There are particular challenges in the private rented sector which is split between a group of highly efficient properties (often modern flats) and a highly inefficient stock of older, unimproved homes.[103]

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[99] DCLG, *English Housing Survey Headline Report*, February 2012

[100] Independent, regulated non-profit companies

[101] European Commission, Eurostat 2013, http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Housing_statistics

[102] CLG, *English Housing Survey Headline Report*, February 2012. Average SAP rating in OO sector: 55.4 in PRS 55.3 in Social sector: 62.9

[103] Energy saving trust analysis of English Housing Survey 2011 data shows that 14.3% of all English homes were in the relatively efficient C band and 7.34% in the bottom F&G bands. The private rented sector has a significantly higher percentage of both the more efficient and the least efficient stock – 17.2% C banded and 10.6% F&G banded.

Socially rented homes are the most efficient part of the stock, having received substantial investment in energy efficiency upgrades through the Government's Decent Homes Programme (see section 5 *Policies to stimulate energy efficiency*).

The reduction in the number of properties owned by local authorities due to properties being sold into the private sector, and the smaller share of social housing generally, make it more difficult to carry out wholesale improvements to blocks of flats or whole streets or estates. A particular problem is carrying out work where multiple owners are involved.

Non-domestic building tenure

In the UK, two thirds of commercial property is rented[104] and this proportion has increased over the last decade. Leases are also generally becoming shorter, with over three quarters of new leases now lasting five years or fewer. This gives tenants more flexibility and landlords greater responsibility for maintaining the building as well as for major refurbishments. Larger tenants, occupying bigger units, have relatively long leases which often include full responsibility for repairs and insurance. In general, retail warehouses, where demand from tenants has been relatively strong, have the longest leases and industrial properties the shortest.

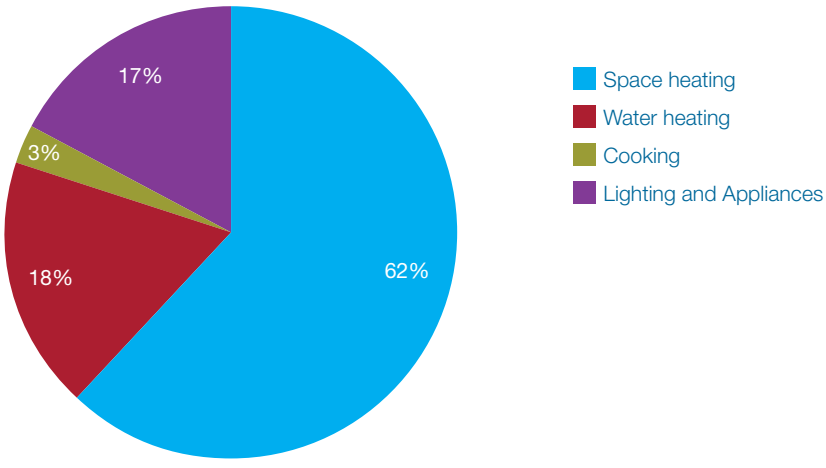
7.4 Energy demand in buildings

Domestic buildings

Heating

By far the largest use of energy in buildings is to generate heat and hot water. Space heating accounts for 62% of final energy consumption and fuel use in domestic buildings, with water heating responsible for a further 18% (see Figure 19).[105] In total, heating within the domestic sector currently accounts for 23% of total UK energy demand.[106] Reducing energy needed to meet heating demand is one of the government's strategic energy efficiency priorities and is the motivation behind policies like the Green Deal and Energy Company Obligation.

Figure 19: Energy consumption by end use in domestic buildings, 2011



Source: Energy consumption in the United Kingdom, 2013

[104] The British Property Federation (BPF). The figure of two thirds refers to the value of property not the number.

[105] Energy consumption in the United Kingdom (ECUK), DECC, 2013 (2011 data)

[106] DECC, *The Future of Heating: Meeting the challenge*, 2013

Central heating systems have become the most common method for heating UK homes. In 1970, less than a quarter of homes in the UK had central heating, increasing to 91% by 2011. This change was driven by the desire for more comfortable homes and the availability of affordable North Sea gas.

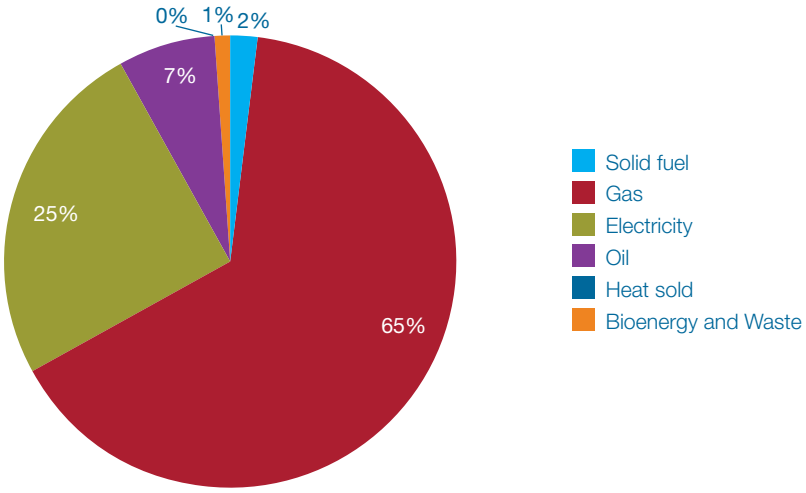
High efficiency condensing boilers have been required in England and Wales since 2005 for new gas boilers and since 2007 for new oil boilers, unless there are exceptional circumstances. Similar regulations have been in force in Scotland since 2006.

In 2010 30% of households had no room thermostat, and 3% had no heating controls at all.[107] To address this, Government introduced statutory guidance accompanying the Building Regulations in 2006 that requires the addition of minimum controls when replacement boilers are fitted. These controls turn the boiler off when there is no demand for either hot water or heating. New or replacement heating systems require a timer, room thermostat and thermostatic radiator valves (TRVs) that allow the setting of temperatures for individual rooms.

Electricity use

Electricity makes up 25% of domestic energy use. Outside of its use for heating, the demand for electricity in domestic properties can be primarily split into its use in cooking, lighting and electrical appliances.

Figure 20: UK share of domestic energy consumption by fuel, 2011



Source: Energy consumption in the United Kingdom

This strategy does not cover the energy efficiency of domestic electricity-using appliances as these are not fixed to the property and are subject to separate EU Regulations. The provision of lighting has seen a number of technological developments with standard incandescent light bulbs being phased out across the European Union and replaced with more efficient lighting technologies such as compact fluorescent lamps (CFL). Previous supplier obligations have accelerated the take up of more efficient lighting. CERT, for example, provided almost 304 million CFLs between 2008 and 2012.[108]

[107] DCLG, English Housing Survey,2010

[108] Ofgem, *Final Report of the Carbon Emissions Reduction Target (CERT) 2008-2012*, (2013)

Table 7: Breakdown of ownership by lighting type

	Standard Light Bulb	Halogen	Fluorescent Strip Lighting	Energy Saving Light Bulb	LED
2002	76%	13%	5%	6%	0%
2012	11%	37%	2%	49%	1%

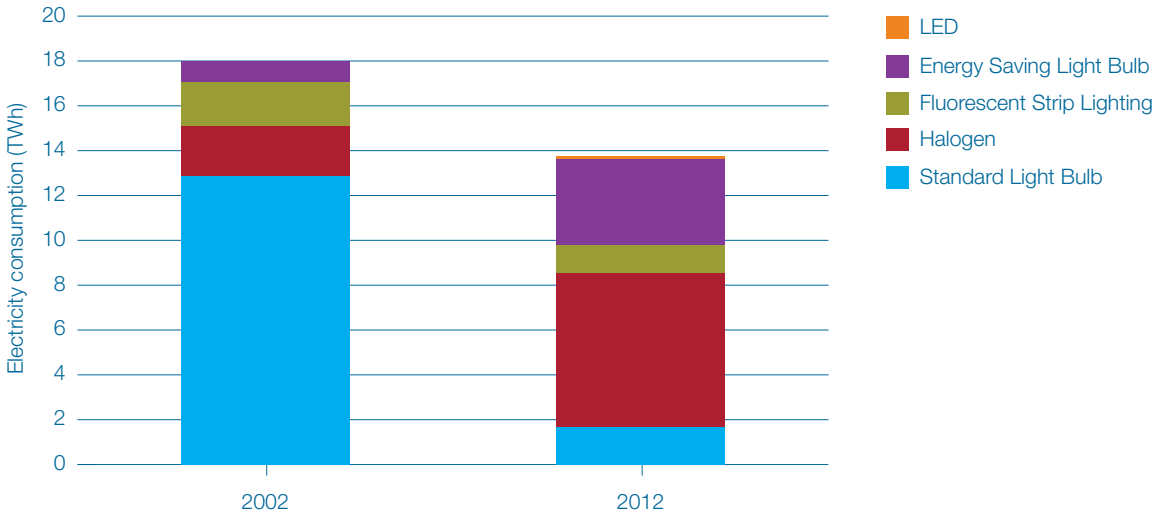
Source: Energy consumption in the United Kingdom

Table 8: Breakdown of energy consumption by lighting type

	Standard Light Bulb	Halogen	Fluorescent Strip Lighting	Energy Saving Light Bulb	LED
2002	72%	12%	11%	5%	0%
2012	12%	50%	9%	28%	1%

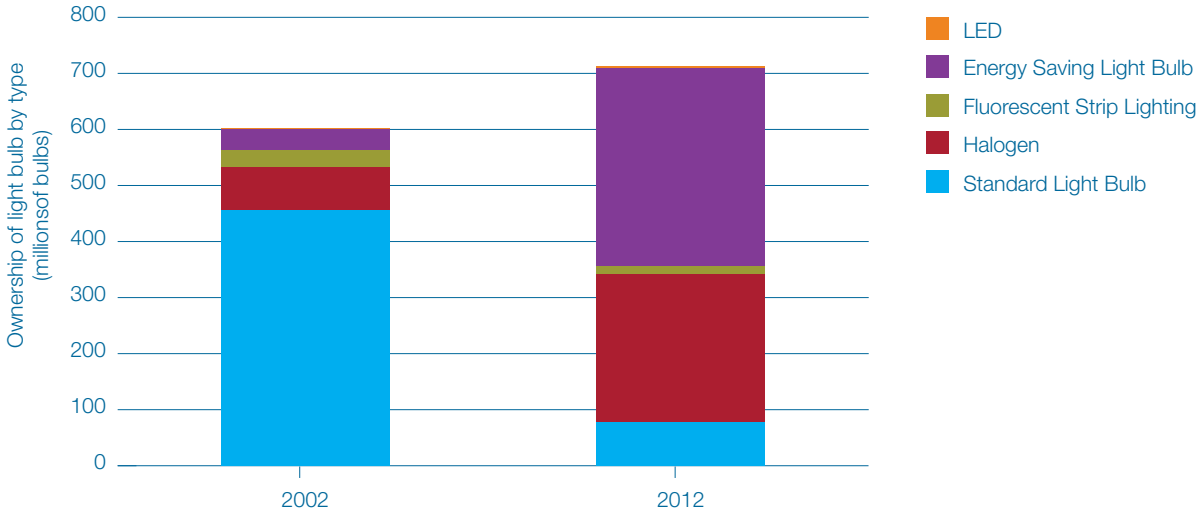
Source: Energy consumption in the United Kingdom

Figure 21: Total domestic electricity consumption by lighting type (tWh/yr)



Source: Energy consumption in the United Kingdom

Figure 22: Domestic ownership of light bulb by type



Source: Energy consumption in the United Kingdom

Table 7 shows that although standard incandescent light bulbs now represent only 11% of lighting installed and a similar proportion of energy usage, there are a large number of halogen spotlights which account for around half the energy consumed in domestic lighting. Single fluorescent strip lights in kitchens, typical from the 1970s to 2000s have increasingly been replaced with high output spotlights. This presents an opportunity for replacement with newer, more efficient Light Emitting Diode (LED) lights.

Non domestic

Energy use in non-domestic buildings is as much to do with the number of occupants, equipment, the hours and type of use and management as the buildings themselves. Unlike in homes, the diversity of building use has a profound effect on the levels of energy used for heating and cooling across the various sectors. Non-domestic buildings may have high inputs from lighting and other electrical processes such as IT, as well as air conditioning where ventilation by natural means may be difficult to achieve.

In addition to high-cost alterations to the building fabric and services, non-domestic buildings offer many opportunities for cost–effective energy savings by avoiding waste and through small improvements. These can include simple measures such as reducing room temperature settings or IT switch-off campaigns. However, with so many parties involved, (including owners, agents, managers, occupiers and a range of service providers) ,it can be difficult to retrofit energy efficiency measures – this is described in more detail in Section 6.

Since conservation of fuel and power provisions for non-domestic buildings were introduced into the Building Regulations in 1974, there has been a gradual tightening and re-focusing of the requirements and guidance from anti-condensation to energy efficiency and then carbon emissions. There has also been a shift from setting standards on an elemental basis to whole building performance compliance, with the introduction in 2006 of the concept of a notional building against which proposed buildings could be compared. The government estimates[109] that collectively the improvements to Part L of the Building Regulations in this sector had saved 13TWh by 2012 and are projected to save 14TWh by 2016, which represented over 40% of the total savings from all energy efficiency improvement programmes and policies in the private and public sectors.

Heating, ventilation and air conditioning

There is a wide range of heating, ventilation and air conditioning (HVAC) system types in non-domestic buildings. The data available on the amount of gas and electricity used for heating implies that gas-fired boilers are the most common form of heating in non-domestic buildings in the UK. However, with the greater volume of heat required and more specialised environments, more complex heating systems are often required – for example, separate heating and hot water systems, or Combined Heat and Power in conjunction with other heat sources where the heat demand is sufficiently high, such as in leisure centres with swimming pools.

Cooling and ventilation accounts for 4% of energy demand in non-domestic buildings.[110] Estimates suggest that 40% of commercial floor space will be air-conditioned by 2020, in comparison to only 10% in 1994.[111]

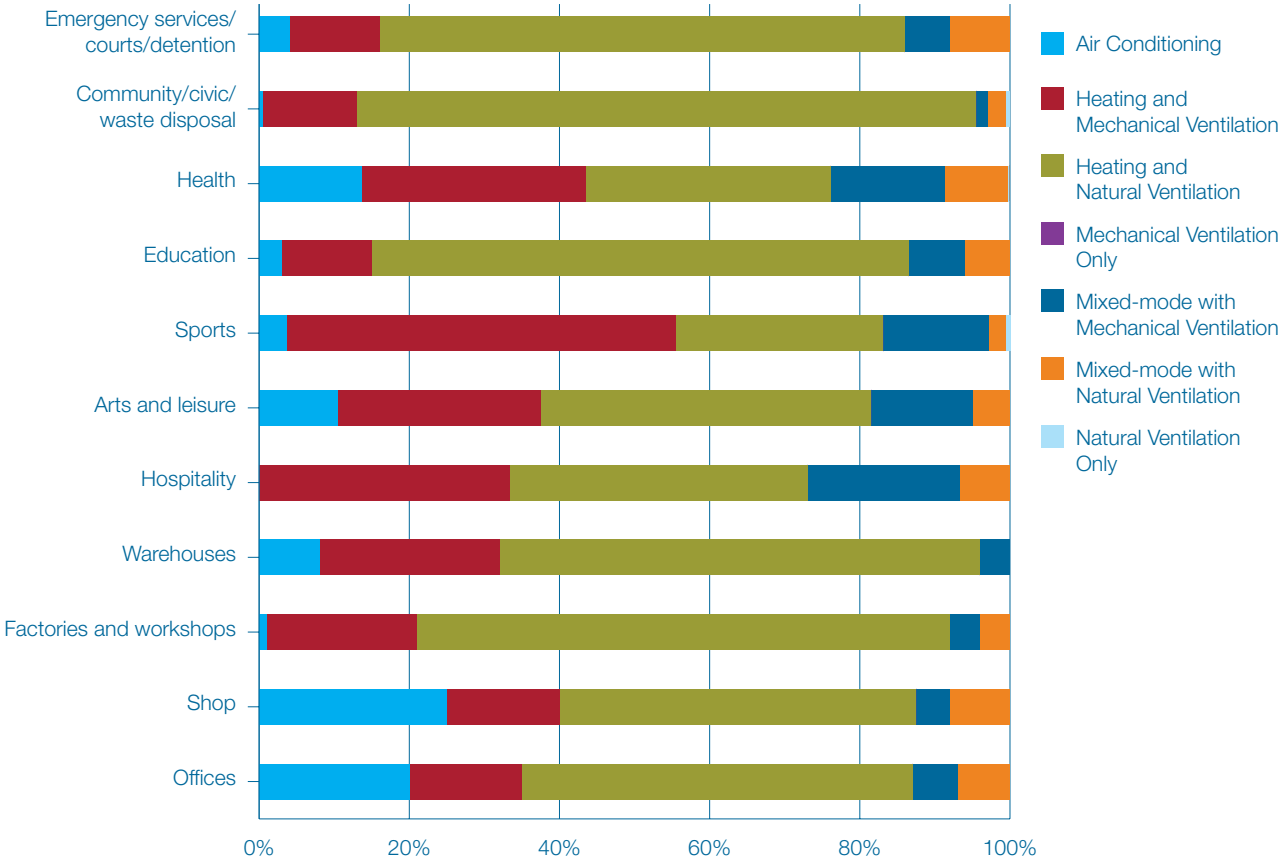
[109] DECC reporting on the December 2013 Article 7 notification for the Energy Efficiency Directive

[110] The Future of Heating: Meeting the Challenge, DECC, 2013

[111] Air Conditioning, Carbon Trust, 2012

Recent analysis of some of the information collected when Display Energy Certificates (DECs) were produced is shown in Figure 23.[112] While not required for all non-domestic buildings, DECs provide some insight into how servicing approaches may vary with building use category.[113] The analysis suggests that air conditioning is most common in shops, offices and transport facilities, while mixed mode – using natural or mechanical ventilation to suit the conditions, is most common in hospitality, arts and leisure, sports and health facilities. Opportunities for saving HVAC energy in these types of buildings should therefore be particularly significant.

Figure 23: Share of energy use by internal environment type: for buildings >1,000m² occupied by public authorities and frequently visited by the public in 2008-2012



Source: DEC analysis by University College London (UCL)[114]

[112] Display Energy Certificates (DECs) are designed to show the energy performance of public buildings, using a scale that runs from 'A' to 'G' where 'A' is the most efficient. They use operational energy data

[113] They are updated either annually if the floor area of the building exceeds 1000m2 or every ten years if between 500-1000m2

[114] Sung-Min Hong and Philip Steadman (UCL): An Analysis of Display Energy Certificates for Public Buildings, 2008 to 2012, A Report to the Chartered Institution of Building Services Engineers, Energy Institute, University College London, October 2013. This was based on analysis of DECs lodged between 2008 and mid-2012. The data was cleaned and processed – for example, to remove uncertain data and duplicate records – and then analysed.

Lighting

Lighting systems and controls in non-domestic buildings in the UK are becoming more efficient. Although still common in display lighting in shops, hotels and restaurants, incandescent lighting luminaires are gradually being phased out, and replaced with more efficient discharge type lighting, which is the most common type found in our buildings. This includes fluorescent lights as well as high pressure sodium lights used in street lighting and warehousing. LED lighting has recently emerged as a highly energy efficient light source which lasts considerably longer than conventional lights providing maintenance cost savings as well as lower energy consumption. They are often chosen as a replacement light fitting for less efficient lamps.

Whilst manual control of lighting is prevalent in non-domestic buildings in the UK, newer buildings and refurbished buildings often incorporate automatic building controls. These can include: occupancy detection, particularly in meeting rooms, toilets and other spaces with intermittent use; and networked control systems with features such as time clock controls, and lighting level detection with dimming controls, more commonly used in buildings with high occupancies such as offices. Sometimes, lighting control systems are integrated with automatic building controls which also control heating, ventilation and air conditioning plant and equipment.

As in the domestic sector, there have been significant technological developments in lighting technology in the last decade, as standard incandescent light bulbs have been phased out across the European Union. In the non-domestic sector, these have been replaced with more efficient lighting technologies such as compact fluorescent lamps (CFL) and fluorescent tubes. The EU's energy labelling regulations have also encouraged the use of more efficient lamps.

Box 12: Energy efficiency in lighting in non-domestic buildings

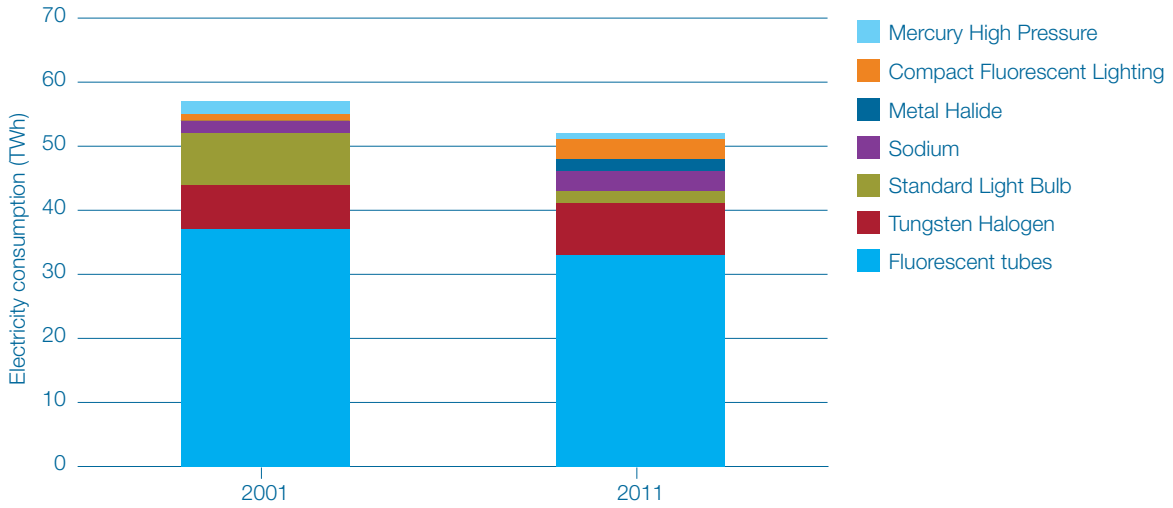
The table below illustrates the increasing use of energy efficient lighting over the last decade – more energy efficient lamps are shown towards the left of the tables, while less efficient lamps are shown to the right. More energy efficient types of fluorescent tubes, particularly T5 fittings, which are generally used in offices, have replaced less efficient forms of this technology. Tungsten halogen fittings, one of the least efficient forms of lighting, are usually used for display purposes, and their use has broadly remained constant in recent years. However, this is expected to change with the introduction of LED lighting which is considerably more efficient. Mercury high pressure lights, generally used in industrial buildings, have been replaced with more efficient metal halide fittings.

Breakdown of energy consumption by lighting type – energy consumption

Year	Sodium	Fluorescent tubes			Metal halide	Compact fluorescent	Mercury high pressure	Tungsten halogen	Standard ligh bulb
2001	4%	1%	42%	19%	1%	2%	4%	13%	14%
2011	6%	20%	41%	3%	3%	6%	1%	15%	5%

Source: Energy consumption in the United Kingdom ECUK

Total non-domestic electricity consumption by lighting type



Source: Energy consumption in the United Kingdom

Energy consumption

In order to understand the energy efficiency opportunities associated with non-domestic buildings, a clear picture of how energy is consumed across each of the building sub-sectors is critical.

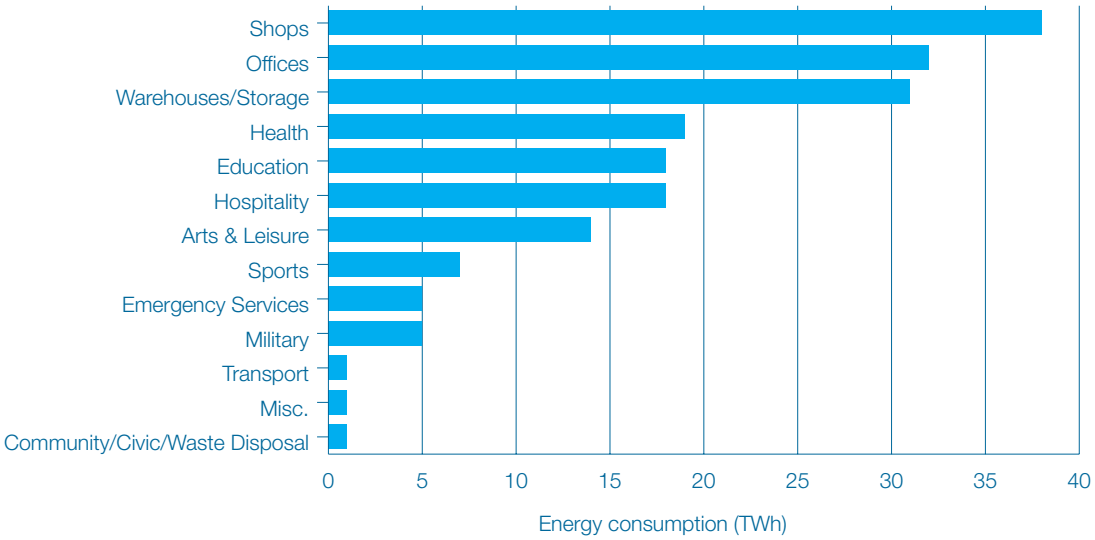
Government is currently undertaking the Building Energy Efficiency Survey (BEES) project, to improve and update the evidence of how energy is used in non-domestic buildings, and assess the energy reduction opportunities in these premises.[115] The results of this project will be available in 2015.

[115] https://www.gov.uk/government/collections/non-domestic-buildings-energy-use-project

The evidence available for this strategy is based on experimental analysis[116] using a combination of data from University College London's building stock model[117] and DECC's National Energy Efficiency Data (NEED) framework.[118] This contains metered gas and electricity consumption data for non-domestic properties in the service sector in England and Wales.[119] Industrial buildings are considered separately in this section of the report since those buildings are out of scope of this new analysis. This method is explained in more detail in Annex B(ii).

The results of the experimental analysis show that the largest building types in terms of consumption are shops (20%), offices (17%) and warehouses/storage (16%).

Figure 24: Total energy consumption by building sector: 2011



Source: Experimental analysis

Energy end use breakdowns for gas and electricity consumption are included in Figure 25.[120] This analysis shows that the overall consumption of gas and electricity across the whole building stock is very similar, at around 95TWh each, but for very different uses. The majority of gas consumption, around 90%, is used for heating and hot water.[121] The Government's heat strategy – The Future of Heating: Meeting the Challenge[122] – sets out specific actions to help deliver low carbon heating across the UK in the decades to come.

Lighting accounts for about 40% of electricity consumption in buildings, while electricity for heating, hot water, ventilation and cooling together account for around 26% of electricity consumption. Both of these areas offer significant opportunity for reducing energy consumption.

[116] This analysis has been undertaken by Verco Global and the Energy Saving Trust on behalf of the UK Government.

[117] Carbon Reductions in Buildings (CaRB) stock model (v2)

[118] https://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework

[119] See Annex B(ii) for further detail and the approach used. It should be noted that the approach taken has generated estimates for primary fuel consumption – that is, including primary fuels other than gas. Although the exact proportion of gas consumption is not known, for the purposes of discussion of the outputs, it is assumed that the dominant fuel is gas.

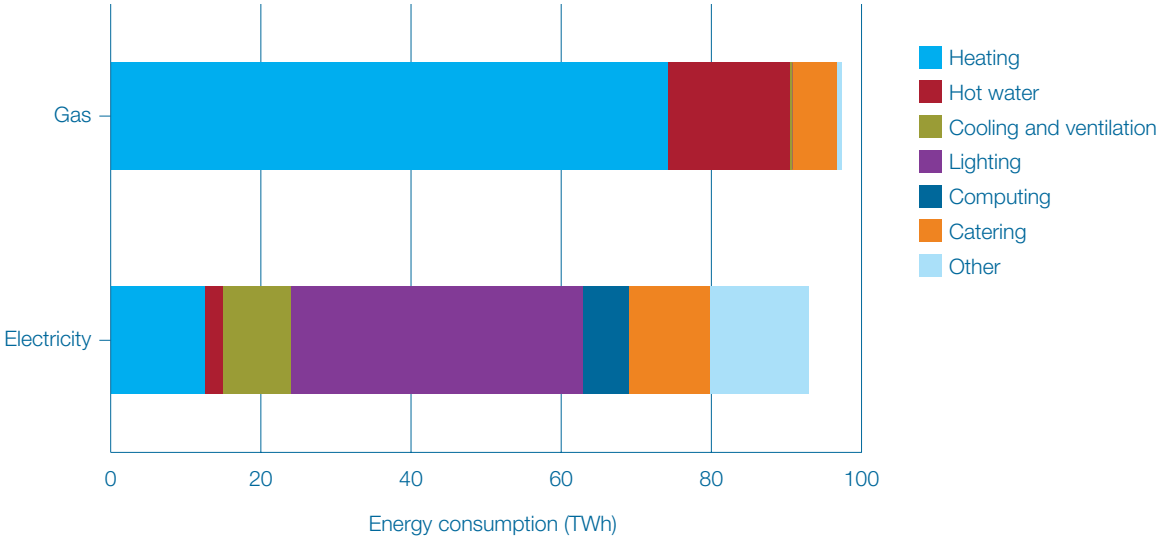
[120] 'Other' includes small power energy consumption.

[121] Excluding heat for industrial processes

[122] The Future of Heating: Meeting the Challenge, DECC, 2013

Government is starting to address this energy saving potential through an Electricity Demand Reduction pilot scheme. Under the pilot, businesses and other organisations which install measures that deliver verifiable reductions in electricity demand will be able to bid for a financial incentive. More efficient motors, air conditioning and lighting are examples of the kinds of measures that could receive support.

Figure 25: Gas and electricity consumption by energy type and end use

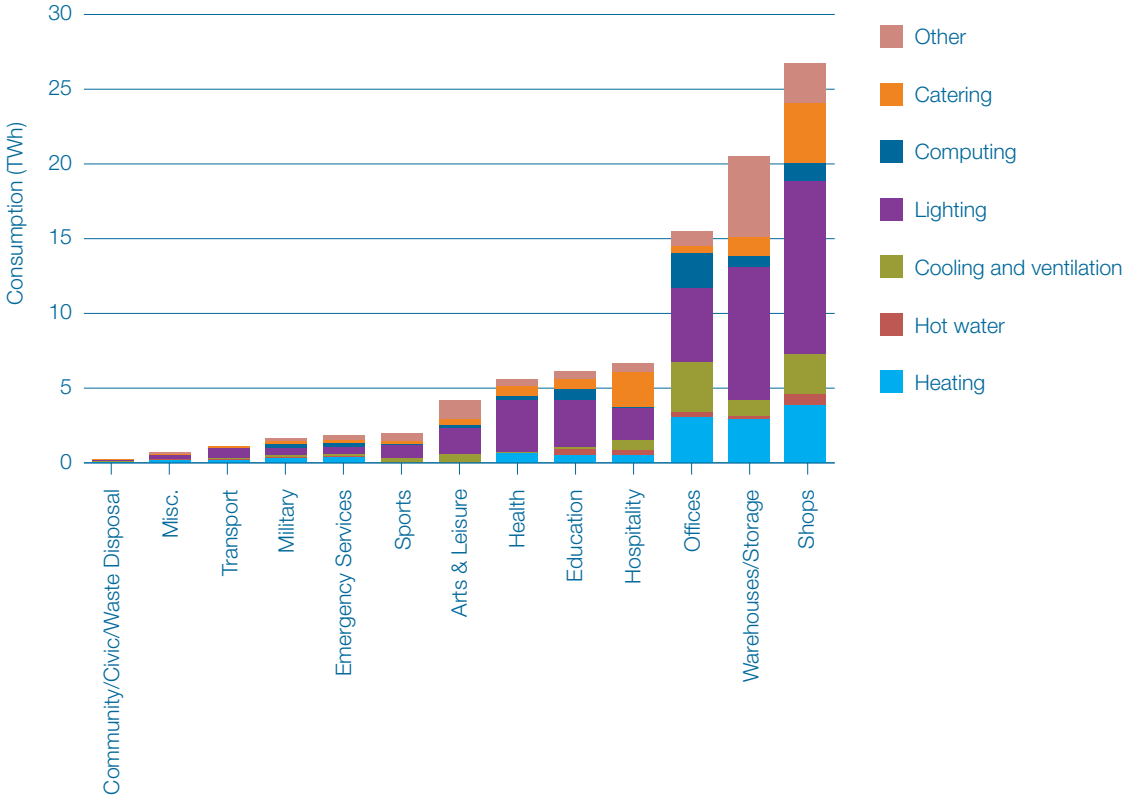


Source: Verco experimental analysis

Figures 26a and 26b show how energy consumption is split between different end uses by building sector, with total energy consumption for each fuel.

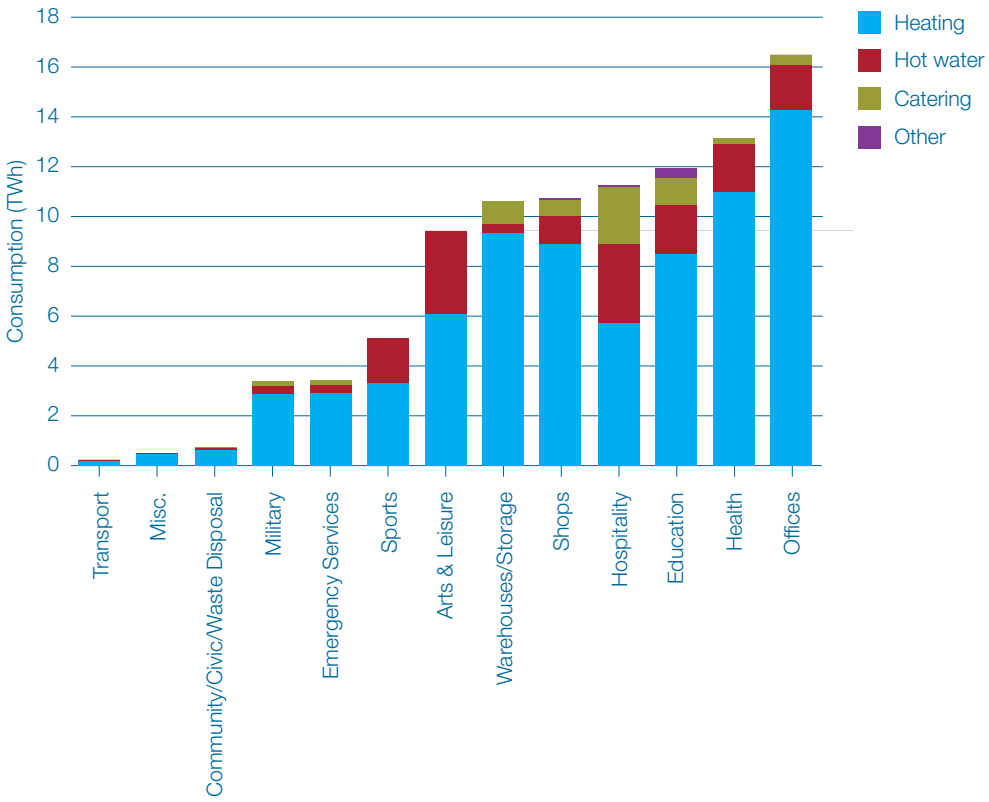
Figures 27a and 27b show that gas intensity (in kWh/m^2) is highest in health, sports, and hospitality, where energy for heating and hot water is the dominant energy end use. Electricity intensity is highest in shops as this sector tends to have higher lighting, cooling and small power demands. For example, tungsten halogen lighting is commonly used in retail for display lighting, which not only requires higher energy levels but is also less efficient. Transport also has a high electrical intensity and, in particular, a high lighting demand intensity due to long operating hours. Higher small-power demands in offices and shops, due to equipment like computers and printers, often results in increased heat gains and hence electricity needs for cooling is greater. These heat gains also allow some office buildings to be virtually self-heating in the winter with internal heat gains from people and equipment recirculated via central ventilation systems or sent for underground energy storage via heat pumps.

Figure 26a: Electricity consumption by building sector, end use: 2011



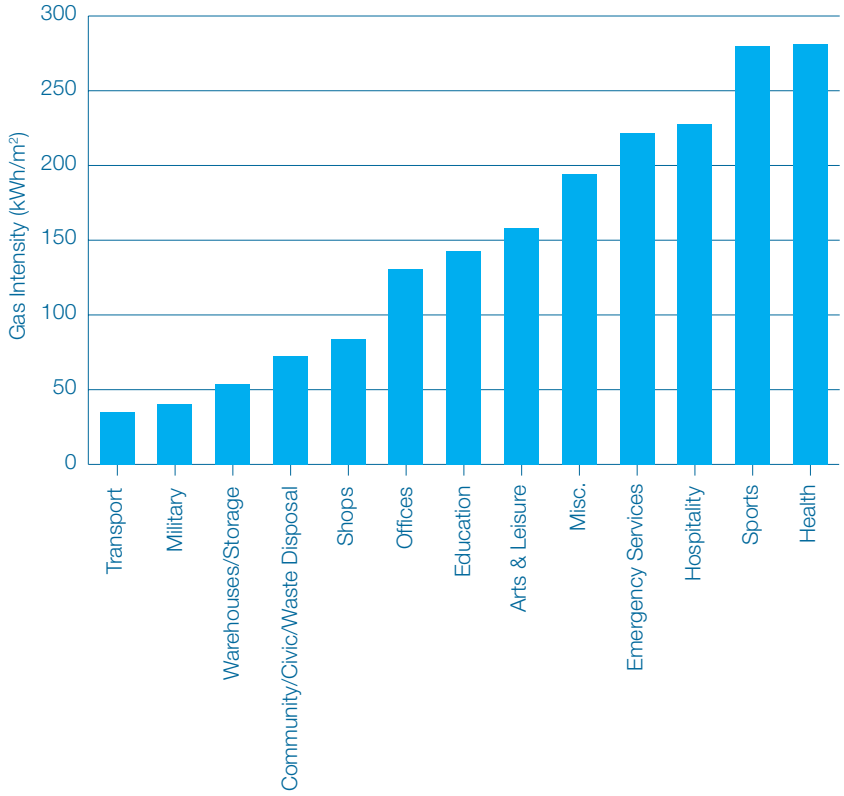
Source: Verco experimental analysis

Figure 26b: Gas consumption by building sector, end use: 2011



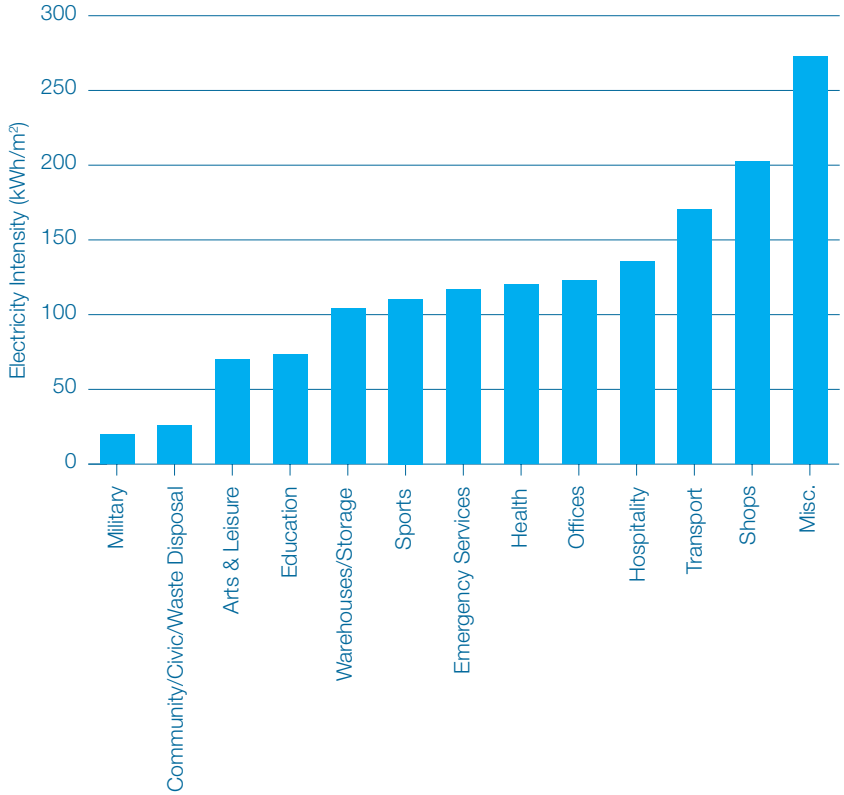
Source: Verco experimental analysis

Figure 27a: Gas intensity by building sector: 2011



Source: Verco experimental analysis

Figure 27b: Electricity intensity by building sector: 2011

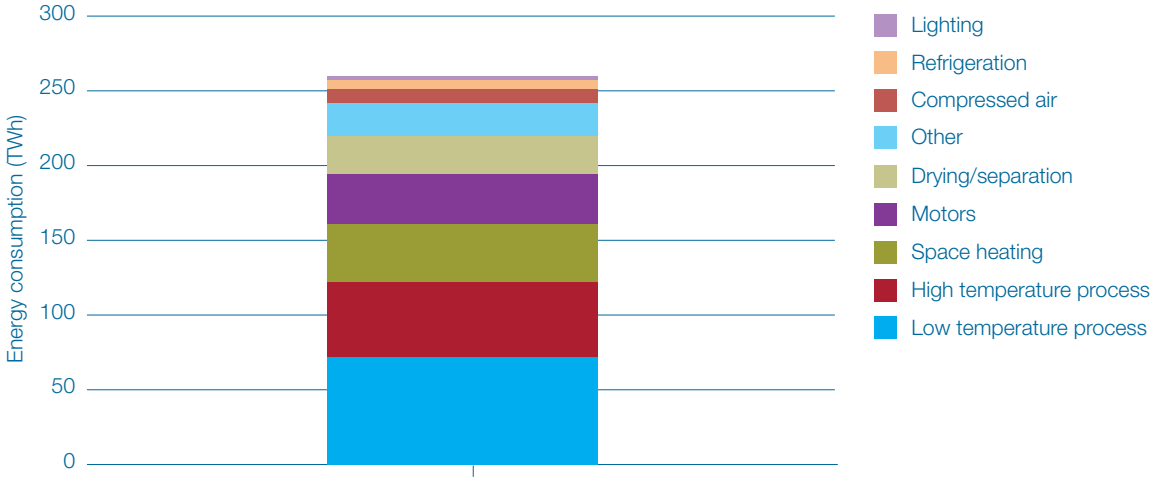


Source: Verco experimental analysis

Separate data for industrial buildings is shown in the figure below. At 261TWh, these buildings alone account for around 28% more energy consumption than the whole of the service sector.[123] Factories, which are often larger buildings than those found in the service sector, are highly energy intensive, with process loads accounting for a large proportion of energy consumption. However, 16% of the total energy relates to space heating and lighting, which are non-process demands. Factories and workshops tend to have proportionally high lighting requirements as buildings are typically very deep-plan spaces with few windows and 24 hour operation.

The Government is supportive of industry-led action targeted at stimulating greater resource efficiency and energy efficiency take up, such as the Next Manufacturing Revolution programme. This is a not-for-profit initiative which aims to help manufacturing companies realise greater profits, employment and sustainability through, among other measures, energy efficiency.

Figure 28: Electricity consumption by building end use: 2011



Source: Energy Consumption in the UK data, Table 1.08

Energy performance

EPCs rate how energy efficient a building is, using grades from 'A' to 'G' where 'A' is the most efficient grade. Each energy rating is based on the characteristics of the building itself (the fabric) and its services (such as heating, ventilation and lighting).[124] The data presented in Figure 29 is taken from a national register of EPCs. EPCs are only required under specific circumstances[125] so this is not fully representative of all building types.

Retail, storage and distribution have a higher proportion of better performing buildings than average (the average to date is a 'D' rating). Retail properties typically have a short term refurbishment cycle and storage and distribution are simple structures which are relatively easy to insulate. Despite the slightly better performance of the retail sector relative to others, Figure 27b shows that it has the highest electricity intensity and therefore significant potential remains.

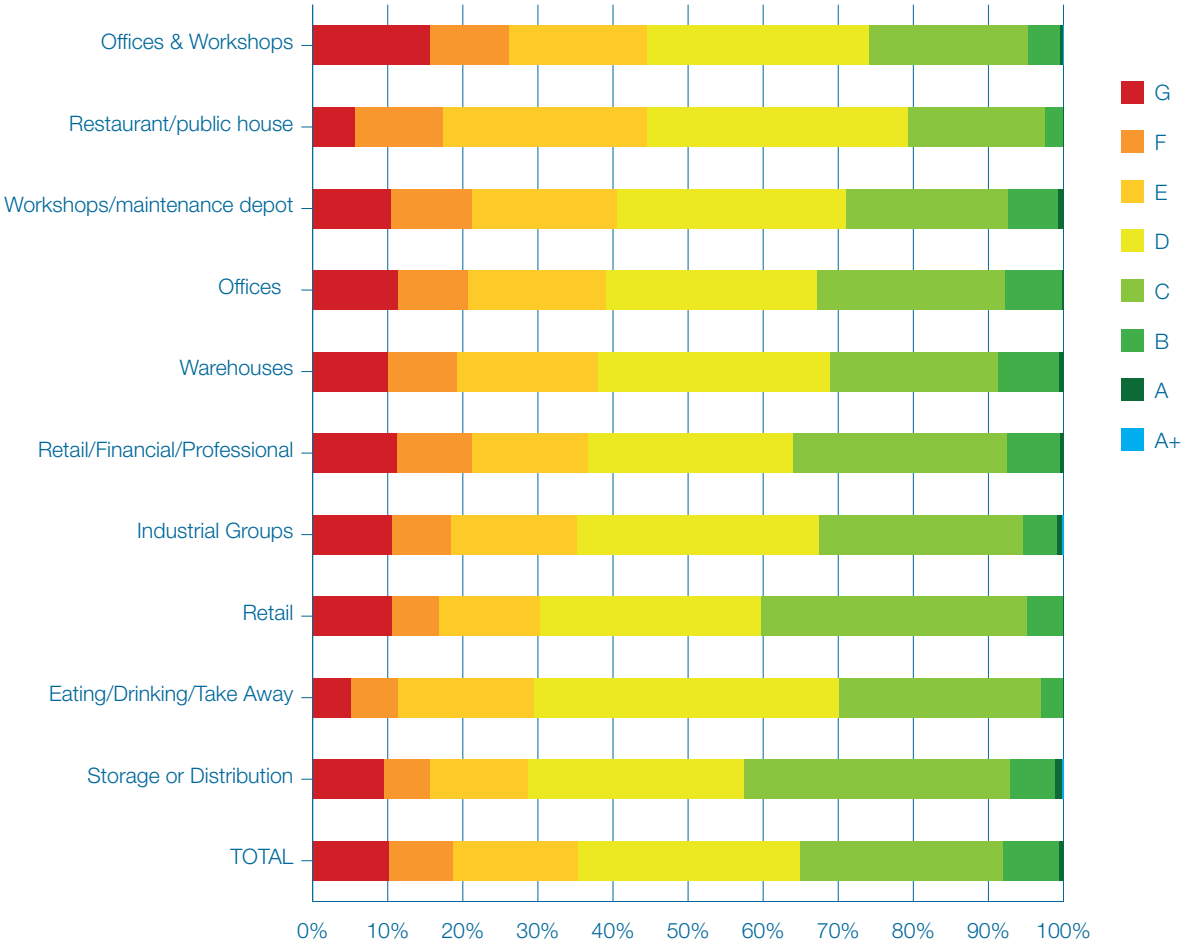
[123] Energy Consumption in the UK data, 2011

[124] NOTE: actual operational energy use may differ as it is affected by actual management, control, usage and unregulated loads

[125] EPCs are required when a premises is rented or sold, when building construction is finished, or when changes are made to the number of parts used for separate occupation and these changes involve providing or extending fixed heating, air conditioning or mechanical ventilation systems.

Restaurants, public houses and workshops have the highest proportion of poor performing buildings. For restaurants, this may be due to high ventilation requirements and limited scope for heat recovery. Public houses are often found in older buildings where fabric and lighting performance may be poor with limited scope for improvement, particularly as they are often leasehold properties. The graphs shown in Figures 27a and 27b show that, overall, the hospitality sector has a high energy intensity, particularly for gas use, suggesting that there may be significant potential for improvement in these types of buildings.

Figure 29: Distribution of Energy Performance Certificate ratings by building sector: 2008 – 2013



Source: Energy Performance Certificate data

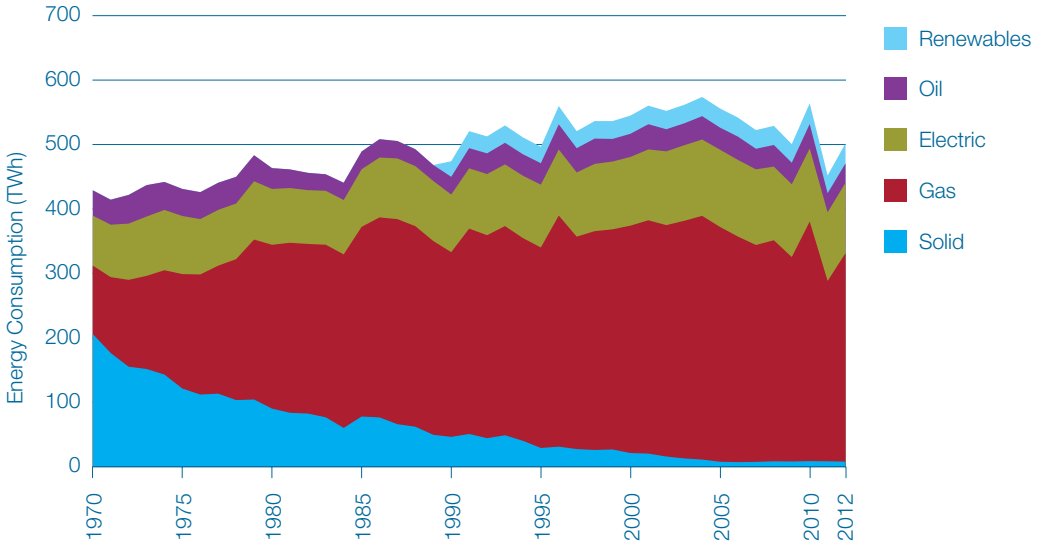
7.5 Energy supply to buildings

Domestic

The fuel type used in homes is dependent on location. Today, gas provides two-thirds of household energy (excluding the gas used to generate electricity in power stations) with 23 million homes (80%) connected to the gas grid. In 1970, gas provided only a quarter of household energy. Solid fuel for heating has declined dramatically over the same period, from providing nearly half the energy used in homes in 1970 to just 2% today (See Figure 30). This is because so few homes now use open fires or coal stoves as their main form of heating.

The four million homes that are not connected to the gas grid use other fuels that vary depending on whether the home is in a rural or urban setting. Rural off-gas homes will typically be in areas not reached by the gas network. The fuels used for heating are mainly electricity and heating oil, with solid fuels and liquefied petroleum gas (LPG) being used to a lesser extent. Northern Ireland is more reliant on heating oil than the rest of the UK due to the limited penetration of the gas network. Urban off-gas homes will be in buildings which have, for a variety of reasons,[126] not been connected to the available gas network. In dense urban environments, the predominant fuel for heating non-gas fuelled homes is electricity.

Figure 30: Fuel use in domestic buildings: 1970 – 2012



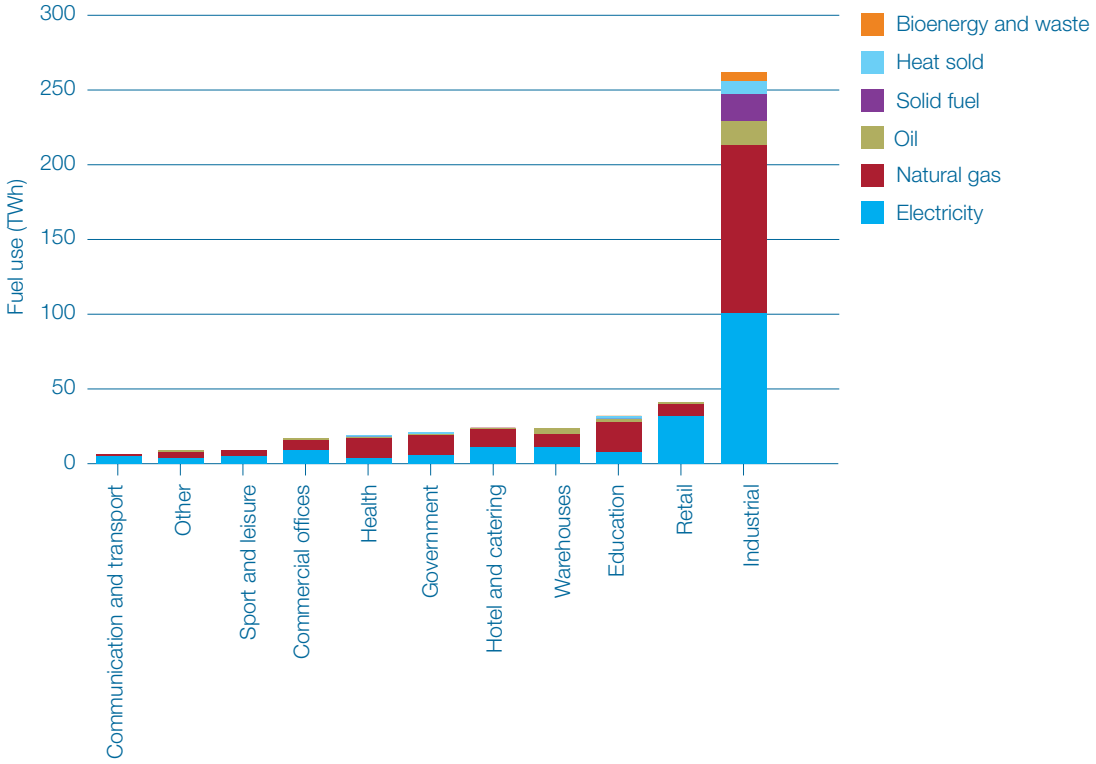
Source: Energy Consumption in the UK

Non domestic

The majority of fuel consumption is evenly split between gas and electricity, and together, these account for approximately 90% of total fuel consumed, while other fossil fuels consumed together account for 6% (see Figure 31). Bioenergy and waste currently only account for 1%, but technologies using this fuel are experiencing growth with the recent introduction of the Renewable Heat Incentive (RHI). The RHI and the Feed-in Tariff are both helping to encourage take up of other renewable energy technologies in non-domestic buildings, such as solar thermal water heating, ground source heat pumps, solar photovoltaics, micro CHP and anaerobic digestion plants. This is described in more detail in section 5.

[126] Gas connections are not allowed in high multi-storey blocks. In smaller apartment blocks gas distribution pipework may simply not have been fitted; apartment owners may prefer electric heating even though it is more expensive because it is easy to maintain and the space-heating demand of apartments is often low.

Figure 31: Fuel use in non-domestic buildings: 2011



Source: Energy Consumption in the UK data, Tables 1.08 and 5.13

Annex B (ii): Methodology used for experimental analysis undertaken on non-domestic building energy use

Methodology for electricity and fossil fuel energy demand analysis

The latest Official Statistics for UK energy use in non-domestic buildings are based on buildings surveyed in the 1990s. Government is currently undertaking the Building Energy Efficiency Survey (BEES) project, to improve and update the evidence of how energy is used in non-domestic buildings, and assess the energy reduction opportunities in these premises.[127] The results of this project will be available in 2015.

This experimental analysis can be done to provide a more timely estimate of energy consumption by building type based on analysis of administrative data.

The primary data source used to obtain energy consumption figures is the UCL Carbon Reductions in Buildings (CaRB) stock model (v2). This model has been developed as part of an on-going research project over the course of a number of years. It includes floor area and property data for each sub-sector obtained from the VOA Rating List of Non-domestic buildings, supplemented by floor area data from multiple other sources to fill any known gaps. It calculates the electricity and fossil-fuel energy consumption using sense-checked typical or benchmark figures (kWh/m^2) for each sub-sector applied to their respective floor areas.

The National Energy Efficiency Data (NEED) framework is a dataset that has been developed by DECC which matches the VOA Non-domestic Ratings List with metered gas and electricity data. It contains actual annual energy consumption data for each building record with matched meters. The dataset is not a complete stock model: only 30% of properties have been matched to electricity data, and fewer than this to gas data. Some sub-sectors are not included in the VOA ratings list such as Crown Properties, heavy industry, places of worship. Other categories are only partially included and lack key information such as floor area.

The analysis relates to the service sector only. Industry has been excluded due to incomplete coverage in CaRB. CaRB data for factories is particularly limited due to the absence of data on large industrial buildings; this is described in more detail later in this section. The agricultural sector has been excluded from this analysis since very little data relating to it is available in CaRB. Industrial consumption data has been sourced from older data used in current modelling published by DECC in Energy Consumption in the UK.

[127] https://www.gov.uk/government/collections/non-domestic-buildings-energy-use-project

Electricity and gas average intensities (kWh/m^2) for buildings in each sub-sector[128] have been grossed-up by the total floor areas for each sub-sector in the CaRB model to obtain representative figures for energy consumption in England and Wales. CaRB values have been used by default where the number of records within a NEED building category, referred to as a Special Category Code (SCAT), is less than 50. Using the remaining NEED data, a trimmed mean energy intensity has been calculated for gas and electricity, with the highest 5% and lowest 5% of the values excluded to remove outliers.

These energy intensities have then been compared with CaRB intensities. Where NEED and CaRB energy intensities have differed by more than 50% or where NEED values exceed 1,000kWh/m^2, NEED energy data has been replaced with CaRB figures in case the NEED data is for an unrepresentative sample. While CaRB data uses benchmarks rather than actual consumption we consider this to be more resilient than NEED which can be influence d by small matched samples.

NEED provides data for electricity and gas consumption, while CaRB figures include consumptions of fuels other than gas – i.e. all primary fuels. Since NEED data has been grossed-up based on CaRB area data, the non-electricity fuel consumption figures obtained in this analysis cover all primary fuels. However, a reasonable simplification has been made in the analysis of the results that the vast majority of this consumption is gas.

Specific areas of uncertainty associated with this analysis are:

- The analysis relates to the service sector only – industry has been excluded due to significant gaps in this sector in both NEED and CaRB. CaRB data for factories is particularly limited due to the absence of data on large industrial buildings; this is described in more detail later in this section
- The agricultural sector has been excluded from this analysis since very little data relating to it is available, either in NEED or CaRB
- NEED energy data is not available for 70% of properties; it does not include non-rated properties, and some sectors are not well-represented, as described above
- CaRB energy intensities are based on relatively old survey data;[129] CaRB area estimates for sub-sectors not covered in NEED/VOA were used, which in many case are very high level

A comparison between the results of this analysis and consumption figures from ECUK data is shown in Figure 32 below. It shows the following:

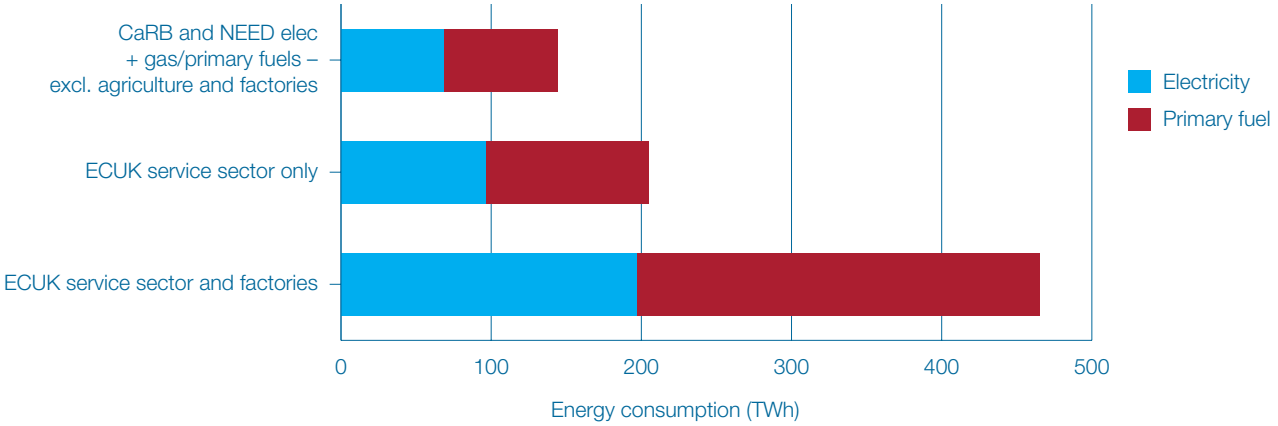
- The first bar shows the core data presented in the main body of the report, with agriculture and industry excluded; this incorporates the modifications to the NEED data described above (i.e. CaRB used where there are less than 50 records within a SCAT.PD category, 5% top and bottom trimming)
- The second bar shows the results of the core analysis but with industry included
- The third and fourth bars show ECUK figures, excluding and including factories respectively; factories account for an additional 261TWh of energy consumption; this enables a like-for-like comparison between the core analysis and ECUK data

[128] Derived from NEED utility data for 2011

[129] The robustness of these typical energy intensities varies from very good for public buildings for which there is up to date DEC data to questionable for commercial buildings where current knowledge typically relies on data collected for limited sample sizes in previous decades. For sub-sectors with no empirical data in either CaRB or NEED, typical values from comparable sub-sectors were used.

The variance between the experimental analysis and ECUK figures is around 7% when industry is excluded, which is considered an acceptable tolerance given the uncertainties referred to above. With industry included, the variance between the two sets of figures is extremely high, with the experimental figures around 50% lower than the ECUK figures. This large discrepancy is the basis for excluding factories from the experimental analysis.

Figure 32: Comparison between experimental analysis and ECUK data



Source: Verco experimental analysis and ECUK, 2011 data

Methodology for energy end use breakdown analysis

Typical energy end use breakdowns for each sector have been derived from the average electricity and fossil fuel intensities (kWh/m^2) resulting from the analysis of CaRB and NEED data described above.

ECUK provides fuel consumption data broken down by building sub-sectors, excluding industrial energy consumption, and by the following end uses:[130]

- Catering
- Computing
- Cooling and ventilation
- Hot water
- Heating
- Lighting
- Other

[130] ECUK, Table 5.13

Energy end use data for industrial energy consumption is provided separately[131] for:

- Space heating
- Process heat (high temperature process, low temperature process, drying/separation)
- Motors
- Compressed air
- Lighting
- Refrigeration
- Other

The proportional breakdowns for each end use, by gas and electricity, have been applied to the total energy consumption figures for each relevant sub-sector.[132]

[131] ECUK, Table 4.07

[132] Some building sub-sectors used in this analysis did not directly relate to those used in ECUK data: the ECUK warehouse sector end use breakdown was therefore used for agriculture and factories sub-sectors, while the ECUK government sector end use breakdown was used for the military sub-sector.

Annex C:
A Review of the Energy Services Market

Introduction

In order to fulfil the requirement under the Energy Efficiency Directive (18(1)(e)), the UK Government has undertaken a review of the current and future development potential of the energy services market.

Given the embryonic nature of the energy services market in the UK there are some limits to the information on which this review is based, but it is hoped that it will be possible to provide a more comprehensive assessment when the next review takes place in three years' time.

Following the guidance from the European Commission, this review focuses on energy saving projects; specifically in the form of Energy Performance Contracts (EPCs).

Types of Available Energy Performance Contracts

EPCs can be defined as energy efficiency improvements provided under a contract and paid for by reference to a specific measure of improvement in the efficiency of the use of energy, such as financial savings, that measure to be monitored and verified during the term of the contract. Providers of EPCs are often known as Energy Service Companies, or ESCos.

The Carbon Trust has developed the following summary of the most common types of energy performance contracts:[1]

- **Guaranteed savings:** This is the most common EPC structure in the UK, in which the ESCo guarantees to deliver the customer with a minimum level of savings. If the total savings are less, the ESCo pays the difference. Savings greater than the guaranteed amount can be split between the parties. All of the contractor's costs (equipment, installation, mark-up, fees and so on) are paid up front by the customer, or are paid on an ongoing basis as energy savings accrue. Contract lengths vary, but are typically four to eight years.
- **Shared savings:** The customer and the contractor agree to share the savings over the contract period according to an agreed formula. The actual cost of the measures is not included in the contract, and the business has no obligation to pay off those costs. In return, the energy performance contractor does not guarantee the savings. Contract terms are usually longer – up to 10 years – because it takes longer for the investment to be recovered, and the risks to the contractor are higher.

[1] These descriptions meet the requirement of Article 18.1(a)(i) of the Energy Efficiency Directive, to disseminate clear and easily accessible information on available energy service contracts.

- **DBOOT (Design-Build-Own-Operate-Transfer) contracts:** The ESCo designs, builds, funds, owns and operates the scheme for a defined period of time and then transfers this ownership across to the customer. Customers enter into long term supply contracts with the ESCo and are charged accordingly for the service delivered. The service charge includes capital and operating cost recovery and project profit. This contract type has been found to be more applicable when including large energy generation assets e.g. combined heat and power engines.
- **Chauffage contracts:** The ESCo takes complete responsibility for the provision of energy services and energy. Effectively the contractor takes responsibility for the operation of a customer's utility or production facilities as well as upgrading them, and often for paying the customer's utility bills. The fee paid by the client is calculated on the basis of its existing energy bill, minus an agreed percentage (e.g. 5-10%).
- **First-out contracts:** The ESCo pays for and installs an energy efficiency upgrade, then takes all the savings until it has recovered its costs. Once these costs are paid, the contract terminates and on-going savings revert to the customer.

The Size and Maturity of the Energy Services Market

Although the ESCo market has had success in other countries – the ESCo market in the US was estimated to be worth over $5 billion in 2011 – it is only just emerging in the UK (research undertaken by the Building Research Establishment has estimated the UK's ESCo market value at around £180 million).

The Government believes that the ESCo model can help save the UK energy and its businesses money. The requirements introduced by the Directive (e.g. the requirement for Member States to establish a model contract 18(1)(d)) will facilitate the establishment of common standards, building trust in the model.

The Government is leading action to grow the market by funding a nation-wide roll out of the Greater London Authority's RE:FIT programme.[2] Since 2008, the London RE:FIT scheme alone has seen contracts totalling nearly £27 million completed and there are contracts worth an estimated £51 million in the pipeline. The nation-wide roll out of RE:FIT should add a further £25 million by the end of 2014/15.

The Government's Electricity Demand Reduction (EDR) pilot – which we expect to launch in summer 2014 – will further stimulate the market, and has the potential to enable energy efficiency projects to compete with power stations for investment, ensuring that they are rewarded for the value they provide to the system. £20 million has been allocated to date for the pilot and it is expected to run for two years.

Sectors in which energy service providers are most active and services provided

Anecdotal evidence available to the Government indicates that energy service providers are currently most active in the public sector and the most common energy performance contract structure provides guaranteed savings. The Government's intention is to further stimulate demand for energy services via the roll out of RE:FIT and by piloting (EDR).

[2] NOTE: nation-wide means across England only.

Size and types of companies providing energy services

There are 13 energy service providers appointed under the RE:FIT scheme. All of these are large companies, and some are multi-national. These energy performance contractors use a wide range of energy efficiency product and service suppliers of varying size, and include numerous SMEs. In addition, the Government is aware of the emergence of SMEs into the energy services market.

Barriers

The UK Government's Energy Efficiency Strategy,[3] published in November 2012 and updated in December 2013,[4] identified four main barriers to the take up of energy efficiency:

- **Embryonic markets**: The UK already has an energy efficiency market but it is small relative to the size of the opportunity. There are significant economic benefits to be realised from growing this market and making energy efficiency a mainstream activity.
- **Information**: There is currently a lack of access to trusted and appropriate energy efficiency information. Where information is available it may be generic and not tailored to specific circumstances, which means that enterprises are not able to fully assess the benefits of an energy efficiency investment. While information on overall energy consumption is available, it is often difficult to identify which specific energy efficiency improvements should be prioritised.
- **Misaligned financial incentives**: Those investing in energy efficiency measures are not always the ones receiving the direct benefit. For example, where an office space is rented out and the tenants are responsible for the energy bill, it is the tenants, not the landlords, who would receive the benefits of energy efficiency measures. In terms of wider benefits such as improved security of energy supply, those individuals making the investment will not always appreciate the benefit to them.
- **Undervaluing energy efficiency**: Partly as a result of the lack of trusted information, the long term benefits of improved energy efficiency are often regarded as less certain. Consequently, energy efficiency is undervalued relative to other investment options and not prioritised as it might otherwise be.

These barriers are often inter-related and work together to reduce investment in energy efficiency. The 2012 Energy Efficiency Strategy considers these barriers in detail and outlines the existing and planned policies which act on the barriers to take up, so that the Government's ambition to realise the untapped energy efficiency potential in the UK economy can be realised.

Future development of energy services market

It is currently not possible to provide an assessment of how the energy services market is likely to develop in terms of growth rate, employment, or areas of activity given its nascent nature. However, to aid the process of undertaking energy performance contracting the Government will, from June 2014, host the following documents on the GOV.UK website, which will be freely available to access and download:

- a 'model' energy performance contract;
- a contract guidance note;
- a best practices guide to energy performance contracting;

[3] DECC, Energy Efficiency Strategy (November 2012).

[4] DECC, Energy Efficiency Strategy (December 2013)

- a guide to financing energy efficiency in the public sector; and
- a guide to financing energy efficiency in the private sector.[5]

In addition, the Government has announced plans to invest an additional £30 million a year over three years to build on its Salix public sector energy efficiency loan scheme. The Government is also considering creating a toolkit to help local authorities considering investments in high efficiency street lighting.

The introduction of the UK Green Investment Bank is a further UK Government initiative that has mobilised investment in the green economy. Set up in October 2012, investment in energy efficiency is a key priority for the Bank and it has been active in supporting energy efficiency projects. The Bank has £3.8 billion available to invest until March 2016.

[5] With the exception of the Contract Guidance Note, these are all required by Article 18 of the Energy Efficiency Directive. Further details are provided in the "Energy Services" section of the NEEAP.

Annex D: Reporting against Article 4 of the 2006 Energy Services Directive

The Energy Services Directive (ESD) was adopted in May 2006. The ESD aims to enhance the cost-effective improvement of energy end-use efficiency in EU Member States. Its provisions include a requirement for Member States to establish a national indicative energy saving target of 9% to be met by the end of 2016.[1]

Under Article 4 of the ESD the UK is required to meet an indicative national energy savings target for 2016 of 136.5 terawatt hours (TWh). This is calculated as 9% of the 2001-05 final energy consumption excluding energy consumption within the EU Emissions Trading Scheme (EU-ETS). The detailed calculation is described in the UK 2011 NEEAP.[2]

Expected UK energy savings

Table 1 below summarises the key policies and measures for which energy and carbon savings have been calculated. The table shows that based on the latest projections the UK expects to exceed the 9% target, delivering 162 TWh in savings by the end of 2016, equivalent to a saving of 11% over the target period. Savings estimates for 2020 are also included, together with an estimate of the savings that were achieved by these measures in 2012.

By 2012, the UK expects to have achieved 119 TWh of savings (or an 8% reduction) which already places the UK on a strong pathway to exceeding the 9% target in 2016.

The household sector is expected to be the biggest contributor to these savings, contributing 51% of total expected savings by 2016, with private and public sector savings expected to contribute 21% of total savings and transport 27%.

UK estimates of policy savings are reviewed regularly based on evidence of take up of installations, changes to the coverage, funding, and requirements of a policy together with inclusion of evaluation evidence. Savings for 2016 have been revised from 207 TWh (14%) to 162 TWh (11%).

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1 Reporting against this target is not repealed in the 2012 Energy Efficiency Directive until 1 January 2017.

2 UK 2011 National Energy Efficiency Action Plan http://ec.europa.eu/energy/efficiency/end-use_en.htm

Table 1 Estimates of observed and projected energy savings from UK policies, TWh[3]

Energy efficiency improvement programmes, energy services, and other measures to improve energy efficiency planned for achieving the target	Annual energy savings expected by end of 2012	Annual energy savings expected by end of 2016	Annual energy savings expected by end of 2020
Household sector	**61.3**	**82.7**	**105.0**
Building Regulations	33.1	46.3	55.7
Supplier Obligations	26.1	28.3	28.0
Products policy	2.0	6.2	13.2
Smart meters/In home displays	0.1	1.9	8.1
Private and public sectors	**31.4**	**34.6**	**47.8**
Building Regulations	13.3	14.8	18.6
Business Smart Metering	0.2	1.4	4.2
Carbon Trust programmes	10.6	5.0	1.7
Public sector loans (Salix)	0.1	0.3	0.4
Climate Change Agreements & Climate Change Levy	3.6	3.0	3.2
CRC Energy Efficiency Scheme	1.1	3.3	6.6
Products policy	2.5	6.9	13.2
Transport	**26.4**	**44.3**	**70.4**
EU Voluntary agreement to 2009	19.8	24.7	25.0
EU new car CO_2 target: 130gCO_2/km in 2015 and 95gCO_2/km in 2020	3.6	10.5	28.3
EU complementary measures for cars	-	1.2	2.3
EU new van CO_2 target: 147gCO_2/km in 2020	0.3	1.6	4.3
Low rolling resistance tyres for HGVs	-	1.1	3.3
HGV industry improvements	0.9	1.8	2.0
Low carbon buses & SAFED	-	0.2	1.2
Local sustainable transport fund	1.7	3.1	2.2
Rail electrification	-	0.1	1.7
Total energy and carbon savings	**119.0**	**161.6**	**223.2**

[3] The figures for Building Regulations differ to the policy savings published in the most recent Energy Projections (September 2013). Because the demand equations in the model underpinning the baseline projections are based on historic energy consumption data, the impact of the progressive tightening of building regulations in the period 1970-2000 has a dampening effect on projections of energy demand post-2000. Published emission projection estimates of policy savings strip this effect out, which understates the expected future impact of building regulations when policy savings are assessed relative to the NEEAP baseline. This effect has therefore been added back into the policy savings for the purposes of this analysis.

Policy savings

Savings have been reported in terms of final energy consumption relative to the baseline set for this target.[4]

For most policies, the savings reported are consistent with savings estimates used in DECC's *Energy and Emissions Projections* published in September 2013.[5] For some policies, significant changes have been made since then and therefore more recent figures have been included.

No new policies have been included in this package since the 2011 National Energy Efficiency Action Plan, although new policies are being developed, for example the Energy Savings Opportunity Scheme (ESOS) that will be included in future DECC projections and will help drive further energy efficiency to 2020. Annex D(i) provides details of the revisions made to energy savings since the 2011 report and the evaluation evidence to support these savings.

Methodology used to assess energy savings

The energy savings from UK policies are calculated according to supplementary Green Book policy appraisal guidelines.[6] The guidance provides a common methodology for key issues such as determining a baseline counterfactual, identifying policy overlaps and avoiding the double-counting of savings, together with providing a common methodology for valuing energy and carbon savings.

The methodology for policies included in the UK package of policies for Article 7 of the Energy Efficiency Directive are notified fully in the December 2013 Notification.[7] For major measures that are not included in the Article 7 notification, methodology notes are provided in Annex D(ii).

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4 Based on the projection pre the UK's Climate Change Programme 2000 for the UK.

5 DECC Energy & Emissions Projections https://www.gov.uk/government/collections/energy-and-emissions-projections Many of the older policies included in this package are now included within the baseline used for DECC's energy projections. The estimates reported against this target include all savings additional to the baseline set for this target, which was taken in the original NEEAP as the 2000 Climate Change Programme so some savings will be different to the national projections.

6 This guidance supplements the HMT Green Book that provides general guidance on how to conduct appraisal and evaluation of energy use and greenhouse gas emissions. https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

7 UK Article 7 Notification (December 2013) http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_uk_eed_article7_en.pdf

Annex D(i): Additional information relating to ESD target savings

Explanation of variations to 2011 estimates

There have been a number of revisions to policy savings since the 2011 NEEAP. These included changes to the policy, revised methodology for calculating savings and revisions made based on evaluation evidence of what measures save or the amount of up-take.

Building Regulations

Changes in the amount of savings from Building Regulations reflect the inclusion of the impact across the whole of the UK. Previous savings were for England & Wales only. The package now includes additional savings from changes to Part L introduced in 2013.

Supplier Obligations

The emission savings from the Energy Efficiency Commitment (EEC) I and II, the Carbon Emission Reduction Target (CERT), and Community Energy Saving Programme (CESP) have changed since 2011. The downward revisions reflect an updated evidence base on energy efficiency measures and are mainly due to reductions in:

- the assumed theoretical lifetime energy savings associated with each individual measure (that is, energy savings under laboratory test conditions);
- the reduction in estimated energy savings once the measures are installed (for example, by applying 'in use factors' – to take into account underperformance once measures are installed in the home – as opposed to under laboratory conditions). The savings for loft insulation were also adjusted to take into account that some parts of some lofts are untreatable as they are inaccessible.

The ECO and Green Deal savings in the previous NEEAP were based on illustrative scenarios of the technical potential for energy efficiency measures (as set out in the 2010 Primary Impact Assessment for the Green Deal) prior to these policies being launched in 2013. Since then, DECC has improved its understanding of the evidence base and developed the ECO and Green Deal policy framework through consultation. The figures in this 2014 return are based on the 2013 Updated Emissions Projections, which reflects our assessment of the impact of the ECO targets currently in legislation and the Green Deal market mechanism launched in 2013.

On 5 March 2014, the Government launched a consultation on the future of the ECO. This consultation included a proposal to reduce one of the carbon saving targets in ECO. Final policy decisions on ECO are subject to consultation views and will only be confirmed later this year. For this return, however, we have adjusted the 2013 UEP estimated ECO figures to reflect the Government's preferred option for consultation. The final ECO policy design and the associated energy saving impact are naturally uncertain at this stage, so these figures should be interpreted as approximate.

Products

Changes since the 2011 report arise from delays in the agreement on energy labelling and EcoDesign implementing measures from those expected at the time and what actually happened. This has the effect of both pushing back the savings in time, and reducing them (because BAU increases and the net policy savings reduce). This is particularly the case for boilers and water heaters, where the expectation would have been imminent regulation, rather than agreement in March 2013, with standards implemented from September 2015. Boilers and water heaters savings would have been the largest single anticipated contribution at the time.

Smart metering

A number of the underlying assumptions have changed since the 2011 report and have had an impact on the reported metrics. Examples include the projected timing of smart meter installations, projected baseline energy consumption and projected carbon intensity of energy consumption.

Climate Change Agreements

High energy using sectors can elect to have a Climate Change Agreement (CCA) by agreeing to specific energy savings targets in return for paying a reduced rate of the Climate Change Levy (CCL) on their energy bills. The reduction is equivalent to the minimum energy levy required by the Environmental Taxation Directive (ETD).

Previous estimates of the impact of this policy were made based on sector targets but it is very difficult to identify which savings are additional to business as usual. Consistent with the approach taken to notification of savings for Article 7 of the Energy Efficiency Directive (EED) the revised savings from CCA have been calculated on the basis of the assumed demand response to price if the energy covered within CCAs was subject to the full rate of CCL. While it is expected that the CCAs will drive additional savings the revised estimate for inclusion is based on this new, more conservative methodology. Details of the method are provided in the Article 7 notification.[8]

CRC Energy Efficiency Scheme

The CRC was set as a cap and trade scheme in March 2010 with a fixed number of allowances sold by the Government each year. The revenues raised by the scheme would have been recycled back to participants according to a performance league table using a metric based on energy efficiency improvements. The cap element and the recycling of revenues raised by carbon allowances issued by the Government under the cap were removed as part of the 2010 Comprehensive Spending Review.

In 2012/13 the CRC went through a major simplification process that is estimated to save participants £275m in administrative costs to 2027. Energy savings in the scheme were estimated based on modelling demand for allowances under different caps. The initial Impact assessment estimated that the coverage of the scheme would result in a trading price of CRC allowance of about £16/tCO_2. The Government has kept the price of CRC allowances broadly in line with the original results, so savings from the scheme have not been revised in relation to the cost of allowances. However, savings in the scheme have been adjusted due to resulting changes in coverage of the CRC, future energy demand trends and other minor changes in the CRC sector. This comprises:

- Lower energy use as a result of to changes in the UK Energy model (with a significant impact on the public sector, c.30%).
- Revisions due to an overlap with product standards identified.
- Excluding schools from Local Authorities in England as a result of simplification changes.

[8] UK Article7 notification December 2013
http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_uk_eed_article7_en.pdf

- A small increase from energy savings because predicted saving in the Final IA are larger than savings in the Consultation IA.
- Other simplification changes having a minor impact on the coverage of the CRC.

Public sector loans

The Salix scheme provides public sector loans for energy efficiency. The Government has invested additional funding to build on the scheme of £30m per annum for three years commencing in 2014/15.

Transport sector

EU new car regulations

The previous version of the NEEAP presented savings from the interim (2015) target for new car CO_2 emissions and the 2020 target separately. There is no updated analysis that forecasts fuel savings from the 2015 and 2020 targets separately, and which is consistent with the 2013 forecast road transport fuel prices and GDP growth assumptions. These forecast energy savings are based on an estimate of average car fleet fuel efficiency which takes vehicle manufacturers' response to both the interim and long-term targets into account. The estimated savings from the new car targets are higher than previously reported. There are a number of changes to underlying assumptions that will have had an impact on the estimates, including to the key drivers of transport demand (fuel prices; GDP growth and population growth) as well as changes to the car fleet model to take account of updates to existing evidence on technologies and costs.

No changes have been made to estimated savings from the Voluntary Agreement which is superseded by this regulation.

EU complementary measures

These additional measures deriving from EU regulation are designed to deliver savings on top of the new car CO_2 targets and were previously included in the NEEAP as 'additional measures'. Since 2011, we have included these measures as committed policy in the Department for Transport's traffic forecasts and therefore present these savings separately.

EU new van target (147gCO_2/km) for 2020

The savings from the EU van regulation were previously included in the NEEAP as 'additional measures' reflecting the fact that the regulation was not finalised at the point when the previous estimates were included. Since 2011, when the EU adopted legislation setting CO_2 emissions targets for vans, we have included these measures as committed policy in the Department for Transport's traffic forecasts and therefore now present these savings separately.

Low rolling resistance tyres for HGVs

The savings from low rolling resistance tyres for HGVs were previously included in the NEEAP as 'additional measures'. EU regulation 661/2009 concerning type approval requirements for the general safety of motor vehicles has since come into force and therefore we have included these measures as committed policy in the Department for Transport's traffic forecasts. The savings are presented separately.

Low carbon buses and SAFED/Green Bus Fund

The updated estimates of energy savings take account of the full impact of four rounds of the Green Bus Fund; Safe and Fuel Efficient Driving (SAFED) training for bus drivers was assumed to finish in 2009 (when last funded) and therefore is no longer part of the current policy package. Any ongoing impacts of SAFED are included in the bus fuel efficiency forecasts used to generate a modelling baseline for the additional policies presented here. The impact of these changes will be to increase the estimated savings from low carbon buses but decrease the savings estimated due to changes in driver behaviour leading to a net decrease in estimated savings in 2012 and a net increase in estimated savings by 2020.

Local Sustainable Transport Fund

The fund was brought in in 2011 and estimates of the impacts of that funding have been included in transport forecasts and emissions forecasts since that time.

HGV industry-led action

This is a new policy reflecting Government support for industry commitments to reduce CO_2 from road freight between 2011 and 2015.

Rail electrification

Since the previous NEEAP was published, the Department for Transport has committed to a number of rail electrification schemes. Previous energy savings estimates were based on an illustrative scheme which electrified 750km of single line rail track. The new energy savings estimates reflect estimates of the impact of a number of specific electrification schemes including: Great Western Mainline, NorthWest, Midland Mainline and the Welsh Valleys.

Policies not reported in 2014

Warm Front – the latest estimates of energy savings from this policy show negligible changes in energy consumption due to high comfort taking following the installation of energy efficiency or improved heating systems in this programme targeting households in fuel poverty.

Renewable Heat Incentive (RHI) – This policy is primarily about increasing uptake of renewable heating systems to contribute to the UK's renewable energy target, and to reduce carbon. Given the final energy consumption savings are small this has not been included.

Road transport bio-fuels – This was included in the 2011 NEEAP but the energy savings were zero as the fossil fuel saved is replaced with bio-ethanol or bio-diesel.

Evaluation evidence to support savings achieved and projected

The policies included in this package are at different lifetimes and this leads to different levels of evaluation evidence that are available. The UK regularly reviews savings based on evidence to ensure the best estimates are used in policy appraisal and energy projections.

Building Regulations

An implementation review of the Part L 2006 changes to Building Regulations was carried out. This review focused on the significance of the changes of moving to European whole building energy performance targets. This was a qualitative exercise drawn from a workshop with recommendations used to help inform changes in Part L 2010[9]. With regard to the building control system, compliance intervention and customer satisfaction surveys were carried out

[9] http://webarchive.nationalarchives.gov.uk/20121108165944/http://www.communities.gov.uk/publications/planningandbuilding/reviewimplementationpartl

by the Building Control Alliance[10] in 2011/12. Work is under way by the Zero Carbon Hub[11] to explore 'designed versus as built' issues in relation to new build. It should be noted that any performance gap associated with a particular tightening of the building regulations would be relevant to the baseline estimate of building to the original standard as well as building to the new standard. A number of measures to improve compliance and performance were taken within the Part L 2010 changes as outlined in page 48 of the Impact Assessment. In so far as these result in improved performance compared with the baseline then the headline estimates in the Impact Assessment[12] could be an underestimate of the energy saved.

Supplier Obligations

DECC is currently undertaking a final evaluation of the Carbon Emission Reduction Target and Community Energy Savings Programme, which will be published during 2014. This follows on from the interim evaluations of CERT and CESP, which were published in 2011[13],[14]. These evaluations have also helped inform progress made in previous supplier obligations.

DECC is undertaking both a process and impact evaluation of the Green Deal and ECO, which will consider operational delivery and performance, processes and customer experience and impacts. As part of the evaluation, DECC has developed a research programme and appointed a contractor to deliver it.

Products

DECC reports the number and type of energy efficiency products in use in Energy Consumption in the UK[15]. DECC has obtained data on the market shares of energy using products (including lighting, refrigeration and washing machines) which are used to make an assessment of the energy savings from the scheme.

Smart metering

DECC is currently developing its plan for evaluation for the roll out of smart meters, which will include an approach to assessing the energy savings impacts.

Climate Change Agreements

A total of 9,600 facilities have signed up to CCAs accounting for 268 TWh (primary energy) in 2010. DECC is due to evaluate CCAs in 2015 and this evaluation will determine the extent of savings above business as usual.

[10] http://www.buildingcontrolalliance.org/bca-chairmans-update/

[11] http://www.zerocarbonhub.org/sites/default/files/resources/reports/Closing_the_Gap_Between_Design_and_As-Built_Performance-Evidence_Review_Report_0.pdf

[12] http://webarchive.nationalarchives.gov.uk/20120919132719/http://www.communities.gov.uk/documents/planningandbuilding/pdf/1531558.pdf

[13] https://www.gov.uk/government/publications/carbon-emissions-reduction-target-evaluation-of-delivery-and-uptake

[14] https://www.gov.uk/government/publications/community-energy-saving-programme-evaluation

[15] https://www.gov.uk/government/collections/energy-consumption-in-the-uk tables 3.12, 3.13 and 5.16

CRC Energy Efficiency Scheme

The Environment Agency has produced the Annual Report Publication (ARP)[16] under the legislation establishing the scheme, the CRC Order. According to this report CRC Emissions have declined by 7% over the reporting period 2010/11 to 2012/13. These savings are much larger than the savings expected in the initial Impact Assessment (January 2010) which estimated CRC savings to be around 2% per year by 2015.

However, this reduction does not identify what changes can be attributed to the CRC and what to exogenous factors such as the impact of other policies and energy demand trends. DECC is currently undertaking evaluation work to establish what additional savings are attributed to the CRC and it has commissioned a comprehensive evaluation of the CRC Scheme which will help to generate the evidence necessary to measure the impact of the policy, specifically:

- How to identify a counterfactual for the measurement of the impact of the CRC Scheme,
- How to isolate the impacts of the cost, reputational and awareness drivers,
- How to isolate the impacts from other policies and other factors such as the economic situation and the impact of energy prices.

The evaluation work is expected to deliver the final report in early 2015.

Carbon Trust measures

Until 2011, Carbon Trust was grant funded by DECC to provide energy assessments to businesses. A total of 17,000 businesses were audited. These included nearly 200,000 recommended measures. Surveys were undertaken by the Carbon Trust to identify which of these were taken forward by when.

Transport sector

Most of the transport sector policies are set and evaluated at the EU level.

[16] CRC Energy Efficiency Scheme Annual Report Publication, Report – LIT8899, 14 November 2013 http://www.environment-agency.gov.uk/business/topics/pollution/146938.aspx

Annex D(ii): Description of methodology for calculating savings under ESD target

This annex sets out how we have calculated energy savings for policies not included in the UK's Article 7 notification. For policies included in the notification for Article 7, see Annex B of the December 2013 report.[17]

Smart Metering

(a) the duration of the policy:

Energy suppliers will be responsible for the provision and installation of smart meters and are required under conditions in their licences to take all reasonable steps to complete the roll out by the end of 2020.

There are two periods of the smart meter roll out. The Foundation stage during which energy suppliers will trial and test their systems to build market and business readiness for the Mass Roll Out period, where smart meters will be deployed at volume pursuant to their 2020 obligations.

(b) eligible measure categories:

Generally smart metering equipment must comply with the Smart Meter Equipment Technical Specification (SMETS)[18] extant at the time of installation to ensure common minimum functionality and support interoperability. For the non-domestic sector the deployment of meters with some but not all the smart functionality in SMETS is also permissible in certain circumstances.

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

Basis for estimates/materiality of energy savings

The calculation methodology used here is consistent with the approach set out in the January 2014 Smart Meter Impact Assessment.[19]

In the domestic sector customers with a smart meter are assumed to realise gross annual reductions in energy demand of 2.8% for electricity (credit and pre-payment meters); 2% for gas credit and 0.5% for gas pre-payment meters. These assumptions lie within the lower range of trials' results observed both in Great Britain and internationally.

In the non-domestic sector, we assume that smart/advanced meters reduce energy consumption by 2.8% (electricity) and 4.5% (gas) per meter in central scenarios. The primary source of evidence for this is a trial of advanced metering in 538 SME sites carried out by the Carbon Trust in 2007[20].

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[17] UK Article7 notification December 2013 http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_uk_eed_article7_en.pdf

[18] https://www.gov.uk/government/publications/smart-metering-implementation-programme-technical-specifications

[19] https://www.gov.uk/government/publications/smart-meter-roll out-for-the-domestic-and-small-and-medium-non-domestic-sectors-gb-impact-assessment

[20] http://www.carbontrust.com/resources/reports/technology/advanced-metering-for-smes

Additionality

The Government's policy design and implementation work has progressed through various stages. The initial policy design phase concluded in March 2011 with the publication of the Government's Response to the Smart Meter Prospectus confirming the approach chosen for the delivery of smart meters. Key features of the roll out include:

- Energy suppliers will be responsible for the provision and installation of non-domestic smart meters and are required under conditions in their licences to take all reasonable steps to complete the roll out;
- Metering equipment must comply with Smart Meter Equipment Technical Specifications (SMETS) to ensure common minimum functionality and support interoperability (some exceptions apply for the non-domestic sector);
- A central Data and Communications Company (DCC) will provide the communications platform for the secure transmission of smart meter data and messages (for non-domestic suppliers use of the DCC will be voluntary);
- The DCC will be a licenced body regulated by Ofgem, the energy industry regulator.

The energy savings included in this return are based on the latest published Impact Assessment. The Impact Assessment assumes that in the absence of Government intervention no smart metering roll out would occur in the domestic sector. In the non-domestic sector, the Impact Assessment assumes that without Government intervention market participants will only install smart/advanced meters where a positive business case exists for one or more parties. We assume that this would be 50% of the market by 2030.

(d) lifetimes of measures:

A smart meter is expected to last 15 years.

Products policy

(a) the duration of the policy:

Products policy sets a threshold to ensure that products in the EU must meet minimum standards and these minimum standards are very unlikely to be loosened. Therefore, the obligation period has no expiry. There is potential for the minimum threshold to be adjusted to a higher standard but this is not factored into the energy savings.

(b) eligible measure categories:

The eligible measures with respect to product policy are those agreed and implemented under the Ecodesign for energy related Products Directives 2009/125/EC and the Energy Labelling Directive (2010/30/EU).

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

Basis for estimates/materiality of energy savings

The calculations are based on a range of products and assessments of these products. These include the lifespan of individual products (in terms of technical and practical lifespan), energy consumption of products (e.g. by technology type), the level of usage of products (e.g. hours per day), stock market data ((e.g. calculated from market data and scaled according to the latest household figures) and/or sales of products (including breakdown by technology type).

The benefits derived from the policy calculated relative to a business as usual projection of consumption by energy using products.

The calculation methodology provides projections for the average energy consumption of the stock of products, total energy consumption of products, quantity of energy savings and quantity of GHG savings and air quality improvements. All benefits are monetised and weighed against the costs.

(d) lifetimes of measures:

The lifetimes of measures vary between products and are based on the directives; these will persist in line with the directive. These are subject to five-yearly reviews. The current projections are from 2009 to 2030.

Transport

EU Voluntary Agreement to 2009

(a) the duration of the policy:

The agreement sets a standard to be reached by 2009 with savings from these vehicles still applicable in 2016 and 2020. The voluntary agreement has been superseded by EU new car targets.

(b) eligible measure categories:

Voluntary agreement leading to the application of energy efficient technology in cars.

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

The calculation methodology is the same as that set out in the Impact Assessment of Low Carbon Transport: A Greener Future.[21]

Forecasts of new car fuel efficiency improvements with and without the new car targets are used to generate average fleet fuel efficiency forecasts in a model of the UK car fleet. Fleet fuel efficiency inputs are taken together with other drivers of transport demand and emissions (GDP growth rates; population and road transport fuel prices) and used to forecast transport emissions. Estimated savings presented here are based on modelling published by DECC in 2013. The baseline fuel efficiency series assumes no improvement in average new car fuel efficiency from 2009 in the absence of a target regime.

(d) lifetimes of measures:

Standards were tightened until 2009 but the impact of these improvements will be captured over the vehicles' lifetime which is assumed to be an average of 12 years.

EU New car CO_2 target (130gCO_2/km in 2015 and 95g CO_2/km in 2020)

(a) the duration of the policy:

The EU adopted legislation aimed at limiting new car emissions in 2009 with a 95gCO_2/km target set for 2020 with an interim target of 130gCO_2/km in 2015.

(b) eligible measure categories:

EU regulation leading to the application of energy efficient technology in cars.

[21] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

The calculation methodology is the same as that set out in the impact assessment of Low Carbon Transport: A Greener Future.[22]

Manufacturers are assumed to meet the interim and long-term targets for new car emissions at EU level. The actual impact on the efficiency of new vehicles sold in the UK is determined by the current make up of sales across individual manufacturers and the cost of anticipated technology improvements that will be made to reduce emissions at EU level. The impact on average fuel efficiency across the car parc is forecast using a model of the UK car fleet. Total vehicle numbers are estimated based on forecast future transport demand. Fleet turnover in the model is dependent on assumptions around vehicle lifetime. Scrappage rates do not vary by vehicle vintage.

The average car fleet fuel efficiency forecasts are used as inputs to other models including the Department for Transport's National Transport Model and the Department for Energy and Climate Change's Energy and Emissions Model to generate estimates of aggregate emissions and energy savings. The savings presented in the NEEAP have been generated using the DECC model. Fleet fuel efficiency inputs are taken together with other drivers of transport demand and emissions (GDP growth rates; population and road transport fuel prices) and used to forecast transport emissions based on econometric modelling.

Additionality

The impact of the new car targets are measured against a baseline in which average new car fuel efficiency is assumed not to improve after 2009 in the absence of a target regime. Although efficiency across the fleet continues to improve in the absence of the regulations, this reflects continuing turnover and the replacement of older, less efficient vehicles with newer vehicles beyond 2009.

(d) lifetimes of measures:

A twelve-year lifetime for cars is assumed with vehicles bought in 2020 assumed to remain in the fleet until 2032.

EU complementary measures for cars

(a) the duration of the policy:

Complementary measures are a collection of technologies that could improve 'real world' fuel efficiency of cars but which wouldn't be fully captured in CO_2 emissions as measured by the EC whole vehicle type approval process. These are covered by a number of EU regulations including 661/2009 concerning type approval requirements for the general safety of motor vehicles which mandates the introduction of tyre pressure monitoring systems and gear shift indicators, plus sets limits on the level of rolling resistance for tyres sold in the EU; and 2006/40/EC prohibiting mobile air conditioning systems with fluorinated greenhouse gases with a global warming potential of greater than 150 GWP. 2006/40/EC came into force on 1st January 2011, while 661/2009 sets out various timeframes for the introduction of the different measures. It is assumed that once these regulations are in force that they continue indefinitely in terms of the technology applied to vehicles.

[22] http://webarchive.nationalarchives.gov.uk/ and http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

(b) eligible measure categories:

EU regulations leading to the application of energy efficiency technology in cars. Some of these technologies are applicable only to new cars (more efficient mobile air-conditioning; gear shift indicators and tyre pressure monitoring systems) and some can be retrofitted to the existing fleet (low rolling resistance tyres).

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

The calculation methodology is the same as that set out in the impact assessment of Low Carbon Transport: A Greener Future.[23]

Evidence on the impact of the individual measures has been taken from a report by TNO (2006)[24]. These fuel efficiency savings have been implemented in a model of the UK car fleet which forecasts average fleet fuel efficiencies. Total vehicle numbers are estimated based on forecast future transport demand, which in turn is underpinned by assumptions on forecast fuel prices, GDP growth and population growth. Fleet turnover in the model is dependent on assumptions around vehicle lifetime. Scrappage rates do not vary by vehicle vintage.

The average car fleet fuel efficiency forecasts are used as inputs to other models and the savings here have been generated based on modelling which takes fleet fuel efficiency inputs together with other drivers of transport demand and emissions (GDP growth rates; population and road transport fuel prices) and forecasts transport emissions based on econometric modelling. The savings presented in the NEEAP have been divided between the new car regulations and the complementary measures based on the proportion of CO_2 savings from the two policies identified in previous modelling for the Carbon Plan (2011).[25]

Additionality

The impact of complementary measures is measured against a baseline in which the impact of the new car CO_2 regulation has already been captured. The measures are intended to deliver additional real world emissions savings on top of those measured through the type approval process and which are captured in the modelling of the new car CO_2 regulations.

EU new van target

(a) the duration of the policy:

The EU new van regulation limits CO_2 emissions from new vans to a fleet average of 175 grams of CO_2 per kilometre by 2017 – with the target phased in from 2014 – and 147 g/km by 2020.

(b) eligible measure categories:

Regulation leading to the application of energy efficient technology to vans.

[23] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

[24] TNO (October 2006), "Review and analysis of the reduction potential and costs of technological and other measures to reduce CO_2 emission from passenger cars" http://ec.europa.eu/enterprise/automotive/projects/report_co2_reduction.pdf

[25] https://www.gov.uk/government/publications/the-carbon-plan-reducing-greenhouse-gas-emissions--2

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

The calculation methodology is the same as that set out in the impact assessment of Low Carbon Transport: A Greener Future.[26]

Manufacturers are assumed to meet the interim and long-term targets for new van emissions at EU level. The actual impact on the efficiency of new vehicles sold in the UK is determined by the current make up of sales across individual manufacturers and the cost of anticipated technology improvements that will be made to reduce emissions at EU level. The impact on average fuel efficiency across the van parc is forecast using a model of the UK van fleet. Total vehicle numbers are estimated based on forecast future transport demand, assuming average annual vehicle distance travelled remains constant over time. Fleet turnover in the model is dependent on assumptions around vehicle lifetime. Scrappage rates do not vary by vehicle vintage.

The new van fuel efficiency forecasts are used as inputs to other models – including the Department for Transport's National Transport Model and the DECC Energy & Emissions Projections – to generate estimates of aggregate emissions and energy savings. The savings presented in the NEEAP have been generated using the DECC model. Fleet fuel efficiency inputs are taken together with other drivers of transport demand and emissions (GDP growth rates; population and road transport fuel prices) and used to forecast transport emissions based on econometric modelling.

Additionality

The impact of the new van target is measured against a baseline in which average new van fuel efficiency is assumed not to improve after 2011 in the absence of a target regime.

(d) lifetimes of measures:

The vehicle lifetime assumed in the van fleet model is 15 years.

Low rolling resistance tyres for HGVs

(a) the duration of the policy:

The Regulation will come into force in a number of stages, applying an initial limit value and a later, stricter limit value to new types of tyres.

(b) eligible measure categories:

Regulation leading to the application of energy efficient technology

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

The calculation methodology is the same as that set out in the Impact Assessment of Low Carbon Transport: A Greener Future[27] with the exception that aggregate energy and emissions savings have been estimated based on an econometric relationship between key transport drivers rather than detailed transport modelling.

[26] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

[27] http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

The European Regulation concerning type-approval requirements for the general safety of motor vehicles (COM(2008) 316 final), "the Regulation", will introduce a package of measures to improve the safety and environmental performance of vehicles in the EU. The measures include new performance criteria for tyres, including rolling resistance and noise limits.

The rolling resistance of the tyres can make a significant difference to the overall resistance to motion, fuel consumption and CO_2 emissions of the vehicle. The modelling quantifies the impacts of compliance with the limit values for rolling resistance for Heavy Goods Vehicle (HGV) tyres prescribed in the Regulation, in comparison to the current state of technology in the tyre market. The measure has been quantified based on a set of assumptions about the current state of the market for HGV tyres in the UK, the proportion of these that will be affected by the directive, and the impact on fuel efficiency of a unit reduction in rolling resistance. Unlike car tyres, HGV tyres are often re-treaded and re-used – there is assumed to be no impact on re-treaded tyres. The analysis assumes that 37% of vehicles therefore run wholly on re-treaded tyres and 63% run wholly on new tyres.

Modelling is used to produce fleet fuel efficiency estimates assuming the size of the HGV fleet remains constant at 2007 levels. These are used as inputs to models which forecast aggregate transport emissions based on these and other drivers of transport demand including fuel prices, GDP growth and population.

Additionality

The impact of the regulation is measured against a baseline in which there is no change to the current state of technology in the UK tyre market and hence no change in HGV fuel efficiency derived from improvements to tyre rolling resistance.

(d) lifetimes of measures:

The average tyre is assumed to have a lifetime of 100,000 to 120,000 kilometres. Based on the average annual mileage of a rigid HGV this means tyres will be replaced approximately every 1-2 years.

HGV industry improvements

(a) the duration of the policy:

Industry action to reduce fuel consumption from HGVs is in place until 2015.

(b) eligible measure categories:

Voluntary action to reduce fuel consumption from HGVs.

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

Evidence of future industry efficiency improvements is used to produce a forecast fleet fuel efficiency series for HGVs. The evidence from industry relates to improvements in the intensity of freight emissions from all possible methods, and is the best evidence available as it reflects industry aims rather than just technical potential. Hence, this is used to inform the modelling, but an improvement in fuel efficiency alone is modelled. Beyond 2015 no further improvements are assumed to be made.

Estimated improvements based on industry targets for fuel efficiency improvements (5% between 2011-2015) are applied to the fleet fuel efficiency series after low rolling resistance tyres have been taken into account. This gives an updated fleet fuel efficiency series which is an input to the Energy Model.

Additionality

Baseline HGV fleet fuel efficiency forecasts take into account the following factors up to 2030:

- Conventional technological improvement – 0.5% a year based on historical trends
- An adjustment for the introduction of Euro VI engines and the potential fuel penalty (2-3%) associated with them (affecting new engines between 2013-2017)
- Fleet turnover, using an average HGV life of 8 years

Improvements from low rolling resistance tyres are calculated from this baseline, and further efficiency improvements from industry led action are applied on top of this.

(d) Lifetime of measures:

Diminishing returns to industry effort assumed after 2015 with impacts falling to zero in 2026.

Low carbon buses (Green Bus Fund)

(a) the duration of the policy:

Round 4 of the Green Bus fund ran in 2013, previous rounds ran in 2009, 2010 and 2011.

(b) eligible measure categories:

Fiscal incentive leading to the application of energy-efficient technology for buses.

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

Bus fleet fuel efficiency forecasts are produced which incorporate the direct impact of the Green Bus Fund on numbers of low carbon buses purchased for 2012/13 and 2013/14, and then assume increased future uptake of low carbon buses based on assumptions about the development of the market for those vehicles. The fleet fuel efficiency forecasts are used to generate estimates of aggregate emissions from the bus fleet given other underlying drivers of transport demand including fuel prices, GDP growth and population growth.

Additionality

The current and anticipated future impacts of the Green Bus Fund are measured against a baseline where no assumptions are made about increasing uptake of low carbon buses. Included in the baseline are the impacts of eco-driving training on bus drivers to reduce fuel consumption.

(d) Lifetime of measures:

Bus vehicle lifetime is assumed to be around 15 years.

Local Sustainable Transport Fund (LSTF)

(a) the duration of the policy:

The LSTF is a £600m fund which has been awarded to 96 packages of measures designed to deliver sustainable transport between 2011 and 2015.

(b) eligible measure categories:

Financing schemes that reduce end-use energy consumption through shifting travel demand to less carbon-intensive modes.

(c) calculation methodology, including how additionality and materiality are to be determined and which methodologies and benchmarks are used for engineering estimates:

Estimates of the impact of this level of funding have been based on evidence from the Sustainable Travel Towns (STT). Evaluation evidence suggested that funding to the STT led to a reduction in car trips of 8% on average.[28] This figure was used to derive an estimate of the car trips reduced per £ spent on sustainable transport schemes, which in turn was used to form the basis for an estimate of the impact of the LSTF based on the level of funding committed. The car trips were not reduced uniformly across urban and rural areas as existing evidence is based on the impact of sustainable travel programmes in urban areas. There is little evidence on the impact of such schemes in rural areas, though we anticipate that the impact would be less given that journeys tend to be shorter and hence more easily replaced by cycling or walking and that there is greater substitutability between modes in urban areas.

The methodology does not attempt to capture the impact of individual schemes but in future evaluation evidence on observed impacts of particular schemes will be used to improve the assumptions made.

Additionality:

The savings presented in the NEEAP reflect estimated savings attributable to the original funding committed to the LSTF (£560m) beyond actions that were already being funded by local authorities and the private sector to increase the sustainability of local transport. This existing action is captured in the baseline for the modelling as a reduction in car trips relative to a no-investment scenario.

(d) Lifetime of measures:

The Fund runs until 2015 with a decay impact assumed in modelling out to 2025 when the additional impact over the baseline is zero.

[28] https://www.gov.uk/government/publications/the-effects-of-smarter-choice-programmes-in-the-sustainable-travel-towns-full-report

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