DEPARTMENT OF ENERGY & CLIMATE CHANGE

Electricity Demand Reduction:

Consultation on options to encourage permanent reductions in electricity use

Cm 8468 URN 12D/403 November 2012

Consultation on options to encourage permanent reductions in electricity use

Presented to Parliament
by the Secretary of State for the Department of Energy and Climate Change
by Command of Her Majesty

November 2012

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Contents

General information

Purpose of this consultation

This consultation on electricity demand reduction seeks views on what more might be done to incentivise, support and/or encourage the efficient use of electricity. We would like to hear from all interested parties and seek views on:

- opportunities for more efficient electricity use across a range of sectors
- the barriers that prevent this potential from being realised
- whether financial incentives can deliver cost effective reductions that are beneficial to society as a whole, particularly through:
    - premium payments
    - a capacity market,
    - supplier obligation.
- the effective potential for targeted financial incentives and/or voluntary and information approaches.

Issued: 29 November 2012

Respond by: 31 January 2013

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Consultation reference: URN 12D/403 – Electricity Demand Reduction: Consultation on options to encourage permanent reductions in electricity use

Territorial extent:
We recognise the need to work closely with the Devolved Administrations to deliver a reduction in electricity demand across the UK.

In Scotland[1] and Wales[2], the encouragement and promotion of energy efficiency is devolved, while the **regulation** of energy efficiency is reserved. However, in Northern Ireland both the promotion and regulation of energy efficiency is devolved.

Some of the policies in this consultation document may impact on other policy areas that are devolved to Scotland and Wales. Following the consultation we will be

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

[2] Wales National Energy Efficiency & Savings Plan (NEEP) - http://wales.gov.uk/topics/environmentcountryside/energy/efficiency/efficiencyplan/plan/?lang=en

working closely with the Devolved Administrations on the design and delivery of any policies to be taken forward, to ensure that they take account of the differences between the policy frameworks of devolved Governments.

How to respond:
Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Responses should be e-mailed to edr-project@decc.gsi.gov.uk by 31 January 2013 and should be clearly marked 'Consultation on options to encourage permanent reductions in electricity use'.

Hard copy responses should be sent to the address above.

Additional copies:
You may make copies of this document without seeking permission. An electronic version can be found at :
http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

Other versions of the document in Braille, large print or audio-cassette can be made available on request. This includes a Welsh version. Please contact us on the above details to request alternative versions.

Confidentiality and data protection:
Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

We will summarise all responses and place this summary on our website at www.decc.gov.uk/en/content/cms/consultations/. This summary will include a list of names or organisations that responded but not people's personal names, addresses or other contact details.

Quality assurance:
This consultation has been carried out in accordance with the Government's Code of Practice on consultation, which can be found here:
http://www.cabinetoffice.gov.uk/resource-library/consultation-principles-guidance

If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

DECC Consultation Co-ordinator
3 Whitehall Place
London SW1A 2AW
Email: consultation.coordinator@decc.gsi.gov.uk

Executive Summary

1. The Coalition Government is determined to put in place policies that will help drive down energy bills for consumers, reduce input costs for industry, cut carbon emissions and play an important role in delivering a more competitive economy. Our Energy Efficiency Strategy, published on 12 November, demonstrates how addressing all the identified cost-effective energy efficiency potential could save the amount of energy equivalent to 22 power stations by 2020[3]. Electricity Demand Reduction (EDR) measures are a crucial part of delivering this potential[4].

2. To deliver on this strategy, the Government has already developed a series of policies including the flagship Green Deal, that will reduce energy bills for millions of people and small businesses up and down the country. For example, the Green Deal and new domestic Energy Company Obligation will impact electrically heated buildings and together with the deployment of smart meters are expected to reduce electricity consumption by nearly 6.5 TWh in 2030. In addition, the Green Investment Bank will support access to finance and, in time, audits required under the new EU Energy Efficiency Directive will further reduce demand by focusing attention on electricity use in businesses.

3. However, with even greater ambition we can go further and overcome historic persistent barriers to electricity demand reduction. The Department believes that above and beyond existing policies, it should be possible to reduce electricity demand in 2030 substantially. If a 10% electricity demand reduction could be achieved, this could result in electricity system cost savings in the region of £4bn in 2030, and the energy cost savings would more than compensate for the costs of making efficiency investment in homes and businesses. An electricity saving of this magnitude could reduce UK electricity sector carbon emissions by 4.5 $MtCO_2$ in 2030 and importantly and substantively this could save electricity equivalent to that generated by five power stations.

4. This consultation opens up a range of options to unlock the energy savings that are currently embedded in the system, drawing on examples from around the world. The document seeks views on a number of market-wide financial incentives, including a premium payment, use of the capacity market and a new obligation relating to electricity efficiency for non-domestic customers. The consultation also seeks views on the potential for more targeted, sector-specific financial incentives and broader policy approaches by sector, including a number of voluntary and information proposals. Final decisions on the implementation of any financial support mechanism will be taken on the basis of assessment against various criteria including affordability and value for money. Levy funding for any market-wide financial mechanisms would need to come from within the agreed Levy Control Framework and support for these electricity demand reduction measures would need to be traded off against

[3] Based on the 196TWh of potential energy savings from cost-effective measures set out in DECC's energy efficiency strategy.
[4] This does not diminish the scale or urgency of need for new electricity generating capacity as old plant closes and more electricity is used for transport and heating.

support for other measures. If an EDR measure is included within the capacity mechanism it will be subject to the cost control arrangements for it when they are finalised, according to its design and likely classification.

1. Setting the scene

Rationale for electricity demand reduction

Background

1.1. Recognising the social and economic benefits of taking early action to mitigate climate change[5], the UK Government has committed to reduce greenhouse gas emissions by 80% on 1990 levels by 2050; at the same time working towards encouraging equivalent action by the international community. Backed by a number of legally-binding carbon budgets, DECC's policies seek to meet this target at the lowest feasible cost, whilst maintaining secure and affordable energy supplies.

1.2. Essential to the achievement of these objectives is improving energy efficiency. This consultation follows the Government's Energy Efficiency Strategy that sets the Government's overall, high-level strategy for energy efficiency across all sectors and fuels.

A focus on electricity

1.3. As the Energy Efficiency Strategy sets out, the Government already has a wide array of policies targeted at improving energy efficiency generally. A number of these apply to electricity either exclusively (such as regulation of electronic products) or significantly (for example, supplier obligations[6]). However, the analysis supporting this consultation suggests that there is further potential for greater efficiency in the use of electricity and therefore potentially a gap in terms of policies specifically designed to help reduce electricity use. This consultation is designed to address this question.

1.4. Electricity generation is the UK's largest single source of greenhouse gases, contributing around a third of the UK's total CO_2 emissions[7] and is therefore a major focus of policies aimed at cutting total carbon emissions. Reducing overall electricity demand will help reduce emissions from electricity generation in the short term and will mean less generation will be required to meet demand as we move towards decarbonisation of the electricity sector over the longer term.

1.5. Reducing total electricity demand has wider benefits, for example:

i. Security of supply – reduced demand could ultimately make us less dependent on imported fossil fuels.
ii. Improving air quality by cutting non-CO_2 pollutants associated with fossil fuel electricity generation (as long as reduced demand means less electricity from fossil-fuel plants is needed).
iii. Supporting innovation by providing enhanced markets for new electricity-efficiency technologies and business models.

[5] As addressed in, inter alia, the reports of the Intergovernmental Panel of Climate Change and the Stern Review
[6] These include CERT and CESP, and soon the new Energy Company Obligation (ECO)
[7] See http://www.decc.gov.uk/assets/decc/statistics/publications/dukes/318-dukes-2010-ann-e.pdf

1.6. The 2011 Electricity Market Reform White Paper[8] contained a commitment to 'undertake an assessment over the coming year to determine whether DECC should take further steps to improve the support and incentives for the efficient use of electricity'.

1.7. The first step was to develop a clear understanding of electricity use today and in the future, understanding what technical potential there might be for using electricity more efficiently than we do currently and what the real barriers are to its take up.

1.8. The initial assessment[9] was completed in July 2012. It concluded that there is significant potential for greater efficiency in the use of electricity in the UK and that, with current and planned policies, the UK is likely to only realise some of this potential. It also committed the Government to consulting on policy approaches that could best unlock this potential taking into account the existing policy framework, the opportunities of Electricity Market Reform and the Government's wider Energy Efficiency Strategy.

1.9. This document considers options for driving the efficient use of electricity in order to produce a permanent reduction in the use of electricity. It is intended to inform the evidence base on which, if any, additional policies would cost-effectively reduce electricity demand and the costs and benefits of different potential approaches. This will enable the Government to form a view on whether any new policies are needed and to identify any trade-offs needed.

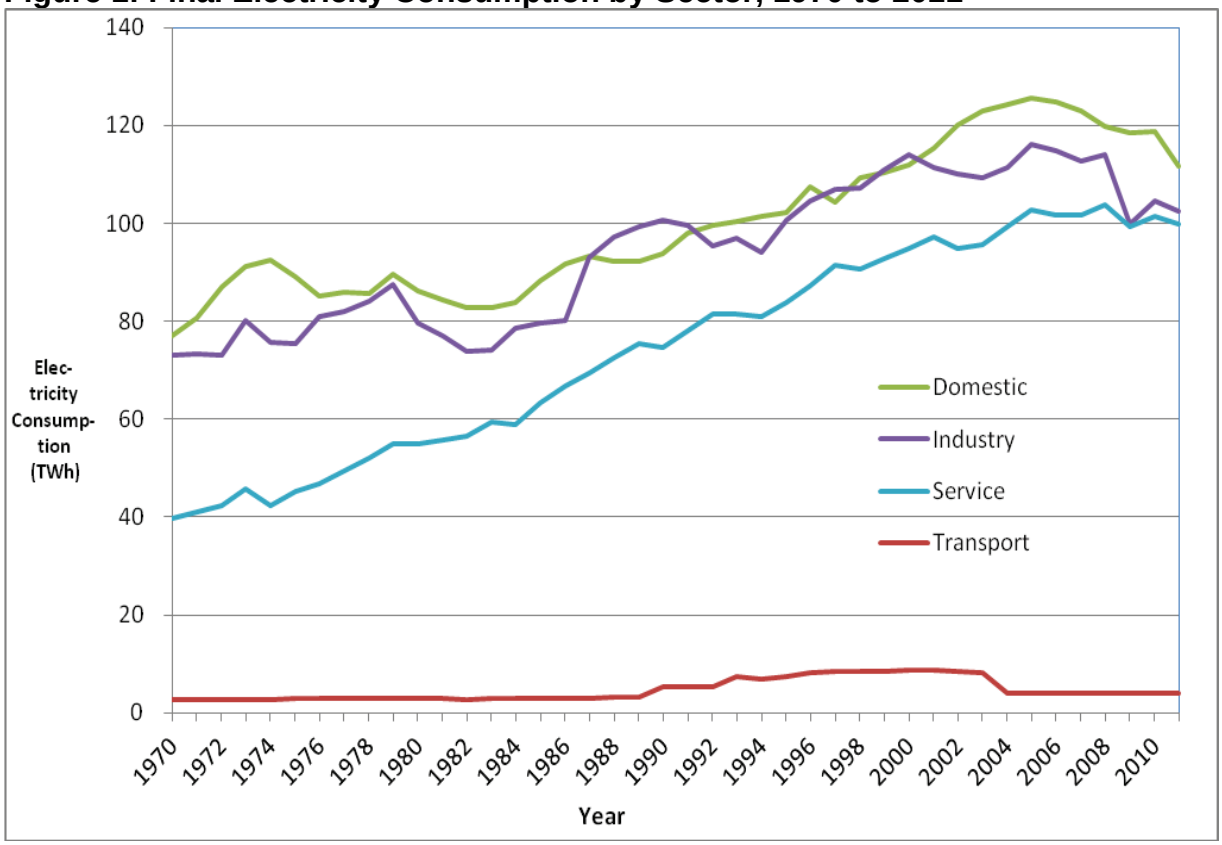
UK Electricity Use and Trends[10]

1.10. Energy use[11] has been flat since 1970, but electricity consumption has increased by more than 65% in the same time. This increase comprises a two and half times increase in consumption by the service sector, and growth of 45% in the domestic sector and 40% in the industrial sector. Recent DECC analysis shows that electricity demand is likely to increase further by between 30% and 100% by 2050.

1.11. Domestic consumption has increased by 45% since 1970 to 112TWh in 2011. Lighting and appliances dominate in domestic usage (28% of total UK electricity), split evenly between consumer appliances, white goods, computing and lighting. Electricity use for space and water heating is currently marginal (and low compared to other countries), but is anticipated to grow in line with the UK's carbon plan, when long-term electrification of heating and transport are expected to increase demand.

[8] http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx
[9] Quotation from July 2012 Report on DECC website
http://www.decc.gov.uk/en/content/cms/emissions/edr/edr.aspx
[10] 'Energy consumption in the United Kingdom' (ECUK)
http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx
[11] Includes all energy sources including, oil, gas and electricity

Figure 1: Final Electricity Consumption by Sector, 1970 to 2011 [12,13]



1.12. In the service sector, including the commercial and public sectors, electricity consumption has grown considerably in recent decades to 100TWh in 2011. 81% of this consumption is attributable to the commercial sector and 19% to the public sector. As is the case for the domestic sector, lighting and appliance use is significant, while electricity use for space and water heating, which is currently marginal, is expected to increase.

1.13. Total electricity consumption in the industrial sector grew 40% from 1970 to 2011 (102TWh in 2011). General industrial usage (e.g. space heating, lighting and appliances), shown in the industry sections of the first two layers of Figure 2 below, is dwarfed by other industry specific industrial applications (fourth layer), including the use of electric motors, which use significant electricity across many industries.

1.14. The energy and transport sectors were responsible for consuming 60TWh of electricity in 2011. Of that, transport, which is predominantly rail, accounted for 4TWh, shown in the bottom thin layer of Figure 2. Of the non-transport elements, shown in the layer just above (still in grey), a major element (28TWh) was grid losses, of which losses from transmission (high voltage, long distance movement) accounted for a substantially smaller share than

[12] DUKES http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx
[13] Note charts showing change over time do not contain energy industry – that time series was not available pre 1998.

from localised distribution. Electricity used by the energy industry, including generators and refineries accounts for 28TWh[14]. This is illustrated below:

Figure 2: Total Consumption in 2011 – areas of interest[15]

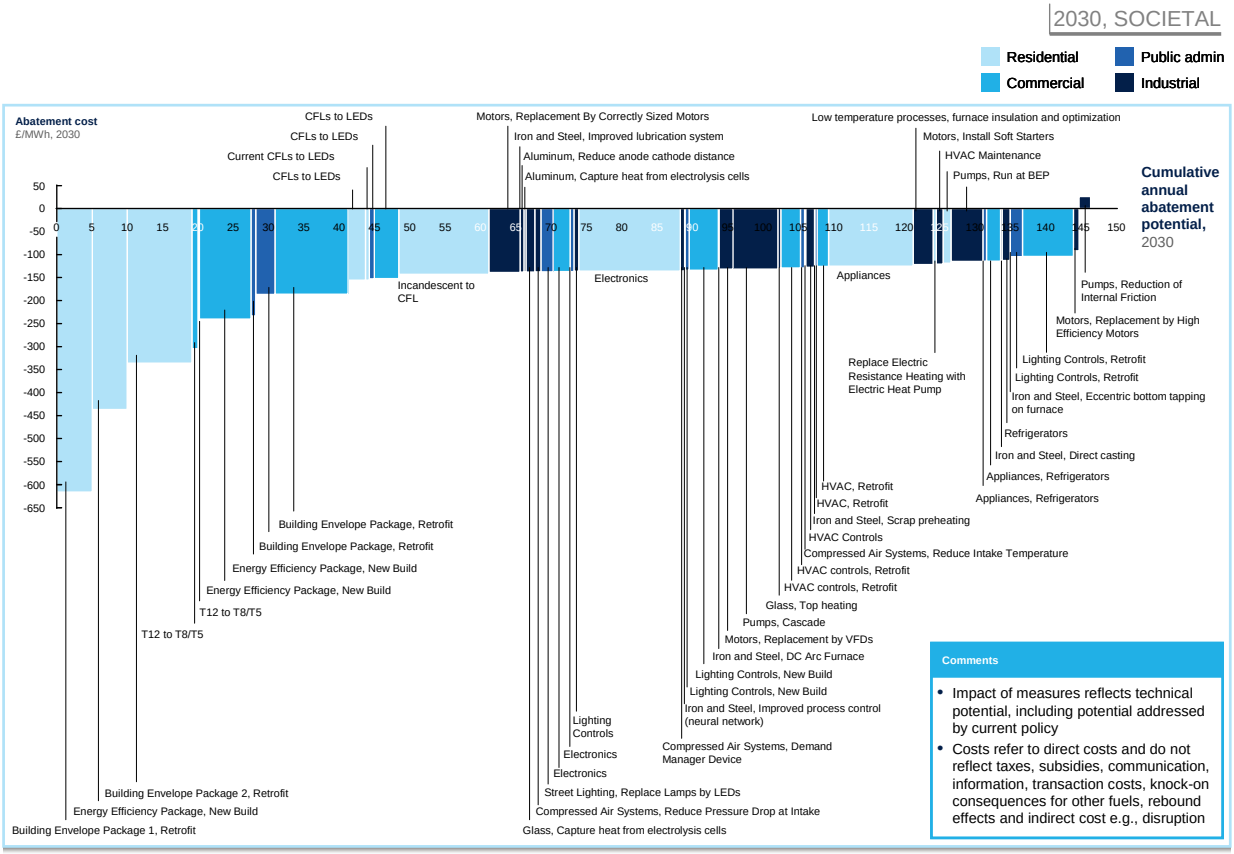
Technical Potential of Electricity Efficiency

Analysis of the potential

1.15. We commissioned McKinsey & Co to help us explore the potential for electricity efficiency in the UK to help improve the available evidence. The results were published on the DECC website[16] in July 2012 for comment. This was an initial view and an updated version is published alongside this consultation.

[14] Note charts do not contain energy industry – that time series was not available pre 1998
[15] Figure 2: BRE modeling(ECUK 1.14a). Note that statistics on energy end users are modeled and are not totally consistent with consumption figures shown in Figure 1.
[16] http://www.decc.gov.uk/en/content/cms/emissions/edr/edr.aspx

Figure 3: Electricity Marginal Abatement Cost Curve 2030 from a societal perspective



Note: Key assumptions for 2030: Discount rate: 3.5%, Electricity price: 12p/kWh, CO2 price: £74/tCO2e; estimated on 2030 'policy off' baseline

1.16. The purpose of a marginal abatement cost curve (MACC) is to present all the measures that can reduce electricity demand (or more usually carbon emissions) on a consistent basis. The x-axis measures the size of the energy saving in a given year. The y-axis represents the cost effectiveness of a measure: measured as £/MWh. The model was calibrated to DECC's October 2011 projections and assesses the potential for electricity reduction based on the estimated share of energy consumption at five year intervals. The model considers the societal benefits resulting from the investment – less use of electricity resources, and where appropriate lower consumption of gas and reduced CO_2 emissions. The Electricity Demand Reduction (EDR) MACC analysis assumes that the capital costs are spread over the lifetime of the measures. While this incorporates the financing costs, it does not take into account whether it would be possible to get such long term financing for measures. This may mean that some measures which appear cost-effective in the analysis would be less cost-effective in reality. In addition, the analysis does not include hassle costs when considering the cost-effectiveness of measures. There is more information on the analysis in Annex 2.

1.17. The report estimates two different EDR-MACCs, as society and a private individual/business value the benefit of an investment differently. The MACC from a societal perspective considers the net societal benefits resulting from

the energy efficiency investment – reduced use of electricity, lower CO_2 emissions and where appropriate lower consumption of gas, offset by the cost of the energy efficiency measure. Lower energy consumption and lower CO_2 emissions where appropriate are valued at the marginal resource cost of energy and CO_2[17], rather than the retail price. The societal MACC analysis assumes that the capital costs are spread over the lifetime of the measures using a 3.5% real cost of finance.

1.18. The MACC analysis from a societal perspective suggests there is around 146TWh of potential for measures that reduce electricity demand in 2030 based on today's known technologies[18]. Many of the measures identified are likely to be implemented (at least in part) in response to existing policy measures – for example the phasing out of incandescent light bulbs. Once the impact of such policies is taken into account, the analysis suggests that around 92TWh of potential is likely to remain untapped. This represents 26% of projected electricity consumption in 2030.

1.19. The analysis suggests there may be untapped potential in the industrial sector, in the region of 23TWh coming from inefficient pump, motor and boiler operation, and in the commercial sector, where improved building insulation and lighting controls could reduce demand by a further 27TWh.

1.20. The report reflects UK demand patterns using DECC's "top-down" demand projections which are based upon high-level econometric projections of demand, as published externally in October 2011. We do not have sufficiently detailed UK-specific estimates of electricity end-use demand and energy efficiency measures (and corresponding investment projections) based on primary data collection across all sectors of the economy.

1.21. Whilst the analysis reflects UK energy consumption patterns at a high-level, it has used a variety of other developed countries experiences to project the energy savings potential of specific energy efficiency measures in the UK. The UK's building stock and building-regulations are different to those of other developed economies, and more detailed research is required to establish how international experience is transferrable to the UK.

1.22. As detailed in Annex 2, the potential for cost-effective abatement as estimated in the report is sensitive to several factors, including the cost of measures, the effectiveness of measures, the underlying levels of demand, and the cost of energy. Further, the analysis does not include the potential hidden or transaction costs that might exist for electricity efficiency products. These costs could be significant and further work is needed to better understand these costs, which may act as a barrier to investment.

1.23. The extent to which existing Government policies will capture some of the estimated potential is difficult to determine with precision. The analysis undertaken so far largely excludes the so-called "rebound effect" associated with energy-efficiency measures, though the estimates of the energy savings

[17] http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx
[18] This is relative to a baseline that includes no Government policies to reduce electricity demand since the Low Carbon Transition Plan in 2009

from domestic-building insulation take into account the direct rebound effect (comfort taking). Further work on understanding the potential for energy efficiency and assessing the effectiveness of existing policy measures is being taken forward to improve the robustness of estimates.

1.24. Reflecting the range of factors that influence the potential for cost-effective energy-efficiency measures, there remains uncertainty as to the abatement potential and cost of abatement, and the research estimates should only be seen as indicative of the electricity efficiency potential, rather than as precise point estimates. When considering the development of specific policy options, DECC will continue to develop its analysis of the potential for cost-effective energy investment measures.

1.25. As set out in the Energy Efficiency Strategy, it is a priority to improve our understanding of the potential for energy efficiency and the effectiveness of existing policy.

Consultation Question	
1.	**DECC would welcome further evidence and analysis to support and increase our understanding of the potential for cost-effective energy-efficiency measures, the abatement potential and the cost of abatement.**

Barriers

1.26. This potential for additional electricity demand reduction exists because a range of market failures and barriers act to limit the take-up of electricity demand reduction opportunities. As a result there is under-investment by the market in technologies which save electricity, and an over-consumption of electricity relative to the social optimum.

1.27. Extensive analysis of the market failures and barriers affecting energy efficiency, including third party survey work undertaken by McKinsey and Carbon Trust[19] for this project, has identified the following issues as being key drivers of low take-up of efficiency opportunities:

- **Agency issues (split incentives)** - wherever there is a split between those responsible for making up-front investments in equipment, versus the party using this equipment this can reduce the take-up of energy efficiency opportunities – for example in a landlord-tenant situation, where the landlord is responsible for funding an upgrade to a lighting system, but the tenant would capture the benefits associated with lower ongoing bills. Another example would be where facilities management is outsourced to a third party or a third party business makes IT hardware purchases.

  Agency issues are particularly relevant to the commercial sector due to the high share of rented commercial property: the analysis suggests 61% of

[19] Carbon Trust report "Exploring the design of policies to increase the efficiency of energy use within the industrial and commercial sector" published alongside this document

commercial office space as being rented, and 75-80% of office space is managed by a third party. In many such contracts, the buildings manager has no performance incentives related to saving energy and hence no incentive to lower electricity use.

- **Imperfect information (lack of awareness and information)** - organisations and households are not specialists in electricity efficiency products and would need to apply time and resources to understand the options for, and benefits of, improving electricity efficiency. They often are unaware of their energy use and the cost-effective efficiency opportunities available and how much money they could save.

- **"Not front of mind"** - often described in the literature as bounded rationality. Organisations and households make decisions about electricity efficiency alongside a wide range of other criteria, in often busy lives. Given the amount of information which has to be processed and the number of issues to be considered, it is not unusual for decision-makers to revert to rule-of-thumb behaviour or to make decisions taking into account only a couple of key parameters. This means that electricity efficiency, which is often not a "front of mind" issue, may be disregarded, even where it would have been beneficial for the decision-maker to take this into account. Behavioural economics research indicates that these issues may be relevant to firms as well as households.

- **Access to finance** - for some companies or households the cost of capital offered by the financial market may be too high to allow them to make electricity efficiency investments.

- **Risk and uncertainty** - survey research has found this to be a significant barrier for firms in the industrial sector. Interviewees noted that risks associated with making changes to well-functioning equipment or processes in order to achieve energy savings may be too great. For example the machinery may not restart or a relatively untried technology will not prove to be successful.

- **Hidden costs**[20] - these are non-financial costs (including transaction costs) faced by consumers to undertake electricity demand reduction projects. For example, the costs of searching for appropriate solutions, identifying reputable suppliers, shutting down production during installation or due to problems integrating new equipment.

- **Hurdle rate/ payback period** - the rates of return which potential investors are looking for from energy efficiency measures may not be achievable. Many respondents to survey research have indicated that they were looking for payback of around two years, whereas on average the measures considered have a pay-back period of around four years. With such a high implicit discount rate, a whole range of energy efficiency technologies which are beneficial from society's point of view (and for the individual/organisation over the longer term) will not be taken up by the private individual or firm.

[20] The data on technological cost-effectiveness provided by McKinsey does not capture such costs.

This may be exacerbated in the current economic climate due to a general caution about investing.

1.28. The Energy Efficiency Strategy has captured these barriers within four broad categories: embryonic markets, information, misaligned financial incentives and undervaluing energy efficiency. The approach taken here is consistent, but with presentation at a more granular level.

Policy landscape

1.29. There are a large number of policies in place already that seek to overcome these barriers and drive efficient behaviour in different sectors, or impact on electricity use. In considering whether any additional policy is desirable, a key consideration has been the impact of existing policy. Key policies of note are described in Annex 1 and include the Green Deal, Energy Company Obligation (ECO), Smart Meters, EU Ecodesign Framework Directive, EU Labelling Directive, Building Regulations Part L (Conservation of fuel and power), the CRC Energy Efficiency Scheme (formerly known as the Carbon Reduction Commitment), and Climate Change Agreements. How these policies impact on barriers is discussed in more detail in Chapter 2.

Why intervene?

1.30. We believe that, despite the impact of existing policy (including agreed policies that are still to be implemented), there still remains significant potential for the UK to be more efficient in the use of electricity. The existence of market failures and other barriers means that the potential uptake of energy-efficient technologies is not being realised in full even though many actions may be cost-effective to the individual or firm concerned. Actions that deliver reductions in electricity demand will help individuals and organisations carrying out the measures reduce bills but will also be beneficial for society as a whole. The benefits of this reduction in electricity demand would be in two forms:

- **Resource cost savings** – reducing demand could reduce the amount of generation capacity and network infrastructure which needed to be built, which in turn would reduce total UK system costs[21]. Customers who reduced their electricity demand would benefit through lower bills due to the reduced volume purchased.

- **Support cost savings** – reducing demand might also lead to a reduced requirement for new low carbon generation reducing the level of support required for deployment. This support is recouped from customer bills so may, in some circumstances, result in a reduction in bills.

[21] These system cost reductions are relative to *what would have happened otherwise* – in reality, any reduction in capacity facilitated by demand reduction is likely to be offset by new demand sources such as the electrification of heat and transport. However, overall system costs will still be lower than under a business as usual scenario where it is cheaper to save a TWh of demand than to build the new generating capacity to satisfy that demand.

1.31. As set out in the Energy Efficiency Strategy, there are also wider benefits of increasing energy efficiency in addition to the specific impacts on the electricity sector.

1.32. **Economic growth:** Installing energy efficiency measures often requires local labour and the investment has the potential to boost employment and economic growth. The business community see this as important in the current economic climate[22]. In addition, lower domestic energy bills can lead to higher disposable incomes to be spent elsewhere, while businesses can see a reduction in running costs and so an increase in productivity. Simple changes in energy use behaviour can deliver some of these benefits with little up-front cost.

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

Conclusion

1.34. Analysis undertaken to investigate how efficiently the UK uses electricity, and what potential for further efficiency improvements remains, has identified significant untapped potential. The research has identified a number of reasons why this potential is not currently being taken up.

1.35. There are already a large number of policies in place designed to overcome the various barriers and impact on electricity use, therefore any additional intervention needs to be carefully considered within the context of the existing policy landscape, and designed to target any gaps. This consultation aims to collect evidence that will allow us to consider whether new policies are needed and, if so, in what form to effect real change and a permanent reduction in electricity demand in the most cost-effective way.

1.36. The position with Scotland, Wales and Northern Ireland and how this consultation might affect them is described in the General Information section (page 9).

[22] Economist Intelligence Unit, Energy efficiency and energy savings: a view from the buildings sector, October 2012 . http://www.globalbuildings.org/resources/uploads/Report_EIU_GBPN.pdf
The colour of growth: Maximising the potential of green business, CBI, July 2012
http://www.cbi.org.uk/media/1552876/energy_climatechangerpt_web.pdf

2. Identifying the gaps

2.1 Introduction

2.1.1. The measures available to reduce electricity demand vary by sector, as do existing policies and barriers. When considering the opportunity to drive additional electricity demand reduction, this consultation has therefore considered appropriate policies on a sectoral basis, including:

i. Domestic building measures.
ii. Non-domestic building measures.
iii. Domestic products and appliances.
iv. Non-domestic products and appliances.
v. Industrial processes.

2.1.2 This approach allows consideration of how existing policies in the same sector interact. This approach also allows new policies to be considered in a way that is unique to their sector.

2.1.3 This chapter sets out the measures and barriers unique to each sector, and explores the impact of existing policy (detail of existing policies is in Annex 1), to recommend possible policy approaches suited to the sector. The subsequent chapters of the consultation describe the potential policy approaches in more detail. The table below summarises the key elements.

Summary of Measures, Barriers and Potential by sector[23]

Sector	Measures and potential	Barriers	Key existing policies
Domestic buildings	Heating systems and insulation in electrically heated homes (the analysis suggests up to 14TWh in 2030 depending on scale of intervention/retrofit). Plus behaviour-change initiatives in all homes (technical potential unknown). Potential in new-build homes has been excluded due to high impact of Building Regulations energy efficiency standards at point of construction.	Lack of information "Not front of mind" (bounded rationality) Landlord tenant split incentives Access to capital	Green Deal and ECO Smart Meter Roll Out Renewable Heat Incentive/Premium Payment
Non-domestic buildings	Around 32TWh identified, including: - 13TWh for whole building retrofit, - 2TWh for Heating Ventilation Air Conditioning (HVAC) retrofit,	Landlord tenant split incentives (66% tenancy in this sector)	CRC Energy Efficiency Scheme Non-Domestic Green Deal

[23] The estimates of abatement potential presented in the table are the full potential ie before the impact of government policy

Sector	Measures and potential	Barriers	Key existing policies
	- 3TWh for HVAC controls, - 9TWh for lighting control retrofit, - 5TWh through installation of high-efficiency lighting. Potential in new-build properties excluded due to high impact of Building Regulations energy efficiency standards at point of construction.	Other split incentives Hurdle rate and payback periods "Not front of mind" (bounded rationality) Lack of information and awareness	Enhanced Capital Allowances
Domestic products	Incentivise people to buy at the top end of the efficiency range, at the point of buying an appliance or product, partly incentivised via the labelling requirements of the EU Labelling Framework Directive. Analysis suggests around 26TWh total potential, although much of this is expected to be captured by Eco Design Framework Directive.	Lack of Information "Not front of mind"/ bounded rationality Split incentives Access to capital	EU Ecodesign Framework Directive EU Labelling Framework Directive
Non-domestic products	Encourage businesses, industry and public sector to buy at the high efficiency end of available electronics (e.g. computers) and appliances (e.g. commercial fridges) at the point of purchase. Around 5TWh potential suggested by the analysis, although Ecodesign Framework Directive expected to capture some.	Split incentives Lack of information "Not front of mind" (bounded rationality)	EU Ecodesign Framework Directive EU Labelling Directive CRC Energy Efficiency Scheme European Energy Star Programme
Industrial processes	The analysis suggests approximately 31TWh in 2030; of which approximately 24TWh relates to pump, motor and boiler operation. This includes both using more efficient components (pumps/motors/ compressors) and optimising overall system for overall higher efficiency.	Risk aversion and uncertainty Unacceptable hurdle rate/payback "Not front of mind" (bounded rationality) Access to capital Product availability Lack of information	Climate Change Levy and Climate Change Agreements CRC Energy Efficiency Scheme Enhanced Capital Allowances EU Ecodesign Directive

2.2 Domestic Buildings

Electricity demand and potential savings

2.2.1 Electricity consumption in the domestic building sector is primarily used for space and water heating. The domestic sector as a whole consumes 112TWh of electricity, of which 20TWh is used for heating[24]. In 2010, there were around 2.6m properties in the UK with electric heating systems, comprised primarily of blocks of flats and rural properties not connected to the gas grid[25].

2.2.2 Electricity demand in the sector is expected to rise by 9% by 2030[26]. However, there remains considerable potential to be more efficient in the way electricity associated with domestic buildings is used, which could mitigate some of this increase in total consumption.

2.2.3 The analysis carried out to underpin this consultation suggests that improvements to building fabric and heating systems of existing properties could reduce electricity consumption by 15TWh by 2030. Improvements in the efficiency of new buildings could save a further 5TWh. In addition to these physical measures, there is considerable potential to reduce electricity demand by encouraging households to change the way they use electricity to heat their home.

2.2.4 There are several existing policies in the domestic buildings sector. This project's analysis estimates that these interventions will deliver around two-thirds of the cost effective reductions achievable from physical measures. Estimating the potential savings from behavioural measures is more complex, since it is difficult to quantify the impacts of behavioural programmes such as enhanced feedback in terms of purchasing behaviour (i.e. uptake of physical measures) versus changes in routine behaviour. However, a review of 57 feedback studies in nine different countries by the American Council for an Energy Efficient Economy (ACEEE)[27] found that on average feedback reduces energy consumption by 4-12%, with higher (9%) savings associated with real-time feedback. Some of this potential will be captured by the roll out of smart meters but there may be scope to go further.

Significant barriers and market failures

2.2.5 In many cases, investing in efficiency measures such as wall insulation or new heating systems can lead to significant reductions in electricity bills. However households are often discouraged from making cost-effective efficiency improvements by a number of barriers as set out in Chapter 1. The key barriers in this sector are:

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[24] DECC energy statistics, http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx
[25] English Housing Survey 2010, scaled to UK. http://www.communities.gov.uk/documents/statistics/pdf/2173483.pdf
[26] Updated Emissions Projections 2012, http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/analytic_projs.aspx
[27] Erhardt-Martinez, Donnelly, Laitner, *Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities*, June 2010

- **A lack of information;**
- **"Not front of mind" (bounded rationality);**
- **Split incentives in the rental sector:** the landlord paying the upfront cost of making improvements to the property may not benefit from the energy savings delivered. In addition, information barriers often mean tenants do not understand the benefit of living in more efficient properties and so this is not reflected in property prices and rents; and
- **Access to finance:** some low income households may not be able to access the capital required for investment in electrically efficient technology they would otherwise make.

Releasing the potential

2.2.6 Existing policies[28] cover some of the potential in the domestic building sector. The remaining cost effective potential from physical measures is estimated to be around 14TWh, although there may be scope for further saving from behaviour change. An assessment for DECC by RAND Europe found that some types of intervention can lead to significant changes in domestic energy use behaviours[29].

2.2.7 As described in the following chapters, we have discounted a targeted financial incentive for measures reducing electricity use, but are seeking views on the potential for incentivising demand reduction by making available a financial incentive for behaviour change programmes. This type of intervention could help reduce the "not front of mind" (bounded rationality) barrier to electricity efficiency in the domestic sector.

2.3 Non-domestic buildings - commercial, industrial and public sector buildings

Electricity demand and potential savings

2.3.1. Commercial, industrial and public sector buildings play a significant role in the UK's total electricity demand. Compared to homes, these buildings are more likely to use electricity for heating, ventilation and air conditioning (HVAC), and to have significant lighting loads. In 2011, commercial and public sectors combined used 39TWh electricity for lighting and 22TWh for heating, cooling and ventilation – accounting for 20% of total UK electricity consumption[30].

2.3.2. Many organisations are already taking action to make their buildings as efficient as possible and analysis of electricity consumption in the service

[28] More information on the relevant existing policies can be found in Annex 1
[29] http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/saving-energy-co2/6921-what-works-in-changing-energyusing-behaviours-in-.pdf
[30] Energy Consumption in the UK (ECUK) expressed in TWh; table 1.5 and 5.6a, available at http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=11/stats/publications/energy-consumption/5993-energy-consumption-in-the-uk-all-data-tables-in-t.xls&minwidth=true

sector suggests that UK businesses are more efficient than some European counterparts[31].

2.3.3. However, the review of the technical potential for this project suggests that there is room to go further – particularly by making better use of controls for lighting and HVAC, installing high-efficiency lighting, and insulating properties more effectively. The analysis suggests that roughly 32TWh could be saved through measures in the commercial and public sectors by 2030. Existing policies are expected to capture around 18% of this potential. Many of these measures are very cost effective, with the up-front investment being quickly paid off by energy savings[32].

Significant barriers and market failures

2.3.4. Despite many efficiency measures relevant to non-domestic buildings being cost effective, the Government recognises that there are significant barriers to implementation, which means cost-effective opportunities are not always taken up.

2.3.5. In non-domestic buildings, these barriers include the following, which are described in more detail in Chapter 1:

- **Split incentives between landlords and tenants.** 62% of commercial properties are leased. In these properties, tenants - who would benefit directly from energy savings - may hesitate from investing in efficiency measures if they feel these investments will not pay back within the lifetime of their tenancy, or if they are prevented from doing so by their tenancy agreements. Landlords would not benefit directly from the energy savings, and may only invest in energy efficiency opportunities if they are confident the rental value of the property will increase accordingly;

- **Other split incentives.** Within businesses, those responsible for maintaining a building's fabric or purchasing capital equipment, such as IT, may not have responsibility for energy costs. This may occur in the context of outsourcing of services and, depending on contract terms, may leave no incentive to minimise energy bills;

- **Hurdle rate and payback periods.** A number of businesses effectively restrict their investments to opportunities that will pay back within 2-3 years, which will prevent some cost-effective efficiency opportunities from being taken up;

- **"Not front of mind" (bounded rationality):** For most organisations, energy efficiency isn't core business. When time and attention is limited, focus and investment funds will be directed towards key demands and

[31] Source : Odyssee, 2009

[32] Project analysis (supported by McKinsey) – 32TWh includes 14.3 TWh for building envelope retrofit, 2.1 TWh for HVAC retrofit, 3.7TWh for HVAC controls, 8.2TWh for lighting control retrofit, and 3.9TWh through installation of high-efficiency lighting. The potential in new build properties has been excluded due to the expectation that progressively higher minimum efficiency standards for new buildings will capture the majority of the available potential in these properties.

projects, even where efficiency projects may on paper have offered stronger investment credentials; and

- **Lack of information/awareness:** some businesses remain unaware of their energy use, and the cost-effective efficiency opportunities that would be available for their property.

Releasing the potential

2.3.6. The Government has a number of policies[33] focused on overcoming key barriers and encouraging businesses to take up cost-effective efficiency opportunities. We have considered the following opportunities for additional policy in this area:

- **An access to finance scheme**. Where businesses report being unable to access finance to fund efficiency investment (particularly where the payback periods associated are unacceptably high for the internal investment process), an access to finance scheme may be appropriate to address this.

- **A financial incentive.** A financial incentive could overcome barriers around "not front of mind" and unacceptable payback periods – by making efficiency investments more attractive, of higher priority to businesses, and more financially feasible. It could take two broad forms:

    - **A targeted financial incentive.** Early analysis suggests that a significant proportion of the technical potential for electricity savings is focused in a few discrete interventions (specifically lighting systems, lighting controls and HVAC controls). A targeted scheme focused on these measures may, therefore, be an effective way to drive electricity demand reduction.

    - **A market-wide financial incentive**. As well as incentivising the efficiency interventions covered by a targeted scheme, a market-wide scheme may have the potential to incentivise wider "whole property" approaches to electricity efficiency and hence drive greater levels of demand reduction.

2.3.7. As described in the following chapters, we have discounted an access to finance scheme based on the launch of two new initiatives which seek to address this issue, but are seeking views on the potential for both a targeted and market-wide financial incentive.

2.4 Domestic products and appliances

Electricity demand and potential savings

2.4.1. In 2011, the domestic sector consumed 112TWh of electricity, of this 91TWh was domestic products, including lighting (16%), cooking & appliances (50%)

[33] More information on the relevant existing policies can be found in Annex 1

and consumer electronics/computing (34%)[34]. In analysis of abatement potential, the demand taken by domestic products is projected to be 102 TWh in 2030.

2.4.2. This project's analysis identifies the technical potential to reduce electricity demand by 2030 in this sector at approximately 43TWh (or 28TWh if lighting is excluded). Of this, approximately 60% is captured by existing or planned products policy that will target most major appliances and phase out the worst performers from the market[35].

2.4.3. The trend in the domestic sector is that electricity demand for products will stay flat - while products themselves are becoming increasingly efficient, households are predicted to own more of them. However there may still be some potential to reduce electricity demand, both through even more energy-efficient products and, subject to further evidence, simple behaviour changes in the way they are used by households.

2.4.4. The policies described in Chapter 4, aimed at motivating households to place more importance on energy efficiency via better and more targeted information on electricity bills, could influence electricity and products use in domestic buildings and may be an effective way to target the untapped potential alongside EU product standards.

Significant barriers and market failures

2.4.5. In many cases, buying a more energy-efficient product will be cheaper in the long run when both the running cost of the product and the purchase price are considered together. However, consumers often do not factor this into a purchase decision because of a number of key barriers and market failures. These barriers were detailed in Chapter 1, but most relevant here are:

- **Lack of information/awareness:** Consumers are not aware of the savings in running costs from buying a more energy-efficient product;
- **"Not front of mind" (bounded rationality);**
- **Split incentives:** the person paying the upfront cost of the product is not responsible for the running costs, so does not factor this into their purchase decision (e.g. a landlord purchasing white goods for a domestic rental property); and
- **Access to finance:** some households may not be able to afford the higher upfront cost of buying 'best in class' as opposed to an average model.

[34] See Energy Consumption in the United Kingdom – tables 3.7 and 3.10 – breakdowns are approximate. http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx
[35] For example Directive 2010/30/EU and Directive 2009/125/EC

Releasing the potential

2.4.6. Policy is a major driver of the efficiency of domestic products, most notably two key EU Directives that mandate energy efficiency and labelling standards for certain product categories[36].

2.4.7. Based on the analysis of barriers and market failures, we have considered the following opportunities for additional policy in this area:

- Better information at the point of sale on a voluntary basis; and
- A financial incentive for product efficiency, which could be delivered through a targeted or market-wide approach.

2.5 Non-domestic products and appliances

Electricity demand and potential savings

2.5.1. Products and appliances in the non-domestic sector account for approximately 10% of the electricity used in the UK (31TWh). In 2011 the key sources of electricity demand in this sector were estimated[37] to be from catering (13TWh), computing (6TWh) and other appliances (13TWh)[38].

2.5.2. Analysis for this project suggests that if all organisations across the sector choose high efficiency options when replacing electronic products and appliances such as ICT, commercial laundry machines or vending machines, then approximately 5TWh per year could be saved by 2030 (around 4% of the estimated total demand in the non-domestic sector in 2030)[39].

2.5.3. It should be noted that the 'non-domestic sector' represents a huge variety of organisations and an even larger variety of products and appliances being used by these organisations.

Barriers

2.5.4. Buying more efficient products can save non-domestic organisations money. But several barriers operate in this sector meaning the most efficient products are frequently not chosen. Barriers were detailed in Chapter 1, but key barriers in this sector include:

- **Split incentives** – the person paying the upfront cost of the product is not responsible for the running costs, so does not factor this into their purchase decision (e.g. IT equipment is purchased by a separate team, that is not responsible for paying maintenance and electricity costs);

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[36] More information on the relevant existing policies can be found in Annex 1
[37] See Energy Consumption in the United Kingdom – tables 3.7 and 3.10 – breakdowns are approximate. http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx
[38] Energy Consumption in the UK (ECUK) expressed in TWh; table 1.5 and 5.6a, available at http://www.decc.gov.uk/media/viewfile.ashx?filetype=4&filepath=11/stats/publications/energy-consumption/5993-energy-consumption-in-the-uk-all-data-tables-in-t.xls&minwidth=true
[39] Capturing the full energy efficiency of the UK, *DECC with support from McKinsey & Co*, July 2012 - http://www.decc.gov.uk/en/content/cms/emissions/edr/edr.aspx estimate excludes the potential savings from Industrial refrigeration processes (~1TWh)

- **Lack of Information** – this information gap can be more pronounced on items sold in the non-domestic sector than for domestic products, as fewer products and appliances are covered by EU information and labelling requirements in this sector; and

- **"Not front of mind" (bounded rationality).**

Releasing the potential

2.5.5. Existing policy[40] has a significant impact in this area and has been successful in removing some of the least efficient products from the market and helping buyers to choose more efficient products. However some potential for efficiency in this area is likely to remain. We are therefore considering what more could be done to overcome these barriers and pull buyers towards the higher end of the efficiency spectrum when purchasing appliances.

2.5.6. Based on this analysis, we have considered the following opportunities for additional policy to overcome the barriers in this area:

- **Better information at the point of sale for non-domestic products**;
  - Responding to the perception that lack of information is currently a significant barrier to the uptake of the most electricity efficient products and appliances in the non-domestic sector.
- **Voluntary agreements with businesses to purchase more efficient products**;
  - Seeking to overcome organisational barriers like split incentives and "not front of mind" by encouraging board level commitment to purchase more efficient products.
- **A financial incentive for efficiency, which could be delivered through a targeted or market-wide approach**;
  - Recognising that a financial incentive could encourage organisations to address and overcome most of the barriers to the uptake of efficient products and appliances in the non-domestic sector.

[40] More information on the relevant existing policies can be found in Annex 1

Products and the Public Sector

1. The Government is committed to ensuring the public sector takes a sustainable approach to its operations, including procurement of products and several initiatives that to significantly reduce Government's impact on the environment by reducing emissions of greenhouse gases, waste, water consumption and making procurement more sustainable.
2. **Greening Government Commitments** - these are the Government's commitments for delivering sustainable operations and procurement. They apply to the Central Government estate (central departments and their associated bodies). Commitments related to Electricity Demand Reduction include:
    - 25% cut in greenhouse gas emissions (09/10 baseline) from the Central Government estate by 2015; and
    - Departmental and centralised procurement contracts will embed sustainable procurement by 2015 by purchasing products compliant with the Government Buying Standards[1] and reducing the impact of its supply chain, in particular with respect to carbon. This will increase value for money over the lifecycle of a product.
3. **Energy Efficiency Directive** - this recently agreed EU Directive, which will come into force in 2014, states that Central Government must purchase products, services and buildings with high-energy efficiency performance (provided this is consistent with cost effectiveness, economic feasibility, technical suitability, as well as sufficient competition[2].)
4. **Joint Public–Private Low Carbon Procurement Compacts** - this is a joint initiative between the Department for Business Innovation and Skills (BIS) and the Prince of Wales's Corporate Leaders Group on Climate Change to develop public-private Procurement Compacts. The Procurement Compacts are a statement of commitment from public and private sector customers to buy progressively lower carbon goods and services to demonstrate to potential suppliers that there is a credible and organised market demand for low carbon goods and services. Currently this applies to three product categories; low to zero carbon transport, biomethane and zero carbon catering. All departments and their agencies are encouraged to join the Compacts and make this commitment.
5. The Government is committed to reducing its impact on the environment by taking a sustainable approach to its operations and procurement. It is also considering how public sector spending power could be utilised in pulling through the innovation and manufacture of energy-efficient products, further discussed separately in the Energy Efficiency Strategy.

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

[2] full requirements can be found in Article 5 of the Directive http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52011PC0370:EN:NOT

2.6 Industrial processes

Electricity demand and potential savings

2.6.1. Different industrial sectors use a variety of industrial processes – for example, compressed air, pumping, fan systems (referred to collectively as motor systems), steam systems, and process heating systems. The electricity used by these processes represents one third of total electricity consumption in the UK today.

2.6.2. The analysis for this project has found that, although there are policy measures in place which encourage efficient use of electricity, these do not specifically target processes or systems. The analysis identifies approximately 31TWh in 2030 of potential for electricity efficiency measures in the industrial sectors. The top three industrial measures relating to pump, motor and boiler operation have a potential of approximately 24TWh, of which around 1TWh is already captured by existing policies.

2.6.3. In addition, the Energy Efficiency Strategy takes a broader view of industrial energy efficiency and considers the use of gas and other fuels alongside electricity, linking to the Heat Strategy and the role of Combined Heat and Power.

Significant barriers and market failures

2.6.4. Many firms recognise the benefits of investing in electricity efficiency to lower costs and improve competitiveness. For example, the major users of electricity and the large energy intensive industries take significant steps to be as efficient as possible as this is key to their global competitiveness.

2.6.5. However, there are still significant barriers to investing in electricity efficiency within the industrial sector which the policy options outlined below aim to overcome.

2.6.6. Moreover, advice from the Carbon Trust, the British Pump Manufacturers' Association and others suggests that in many cases the greatest potential for electricity efficiency savings are in optimising whole processes rather than replacing individual components[41]. Some of the measures identified by McKinsey as having the highest potential in this sector, also consider the interaction of the components with the whole system, for example replacing oversized motors with ones of a more relevant size and running pumps at their best efficiency point. Views are sought on whether approaches that encourage a whole system optimisation approach could have the potential to more successfully realise these benefits than a product-only approach. Stakeholder views are also sought on how effective the measures we are proposing may be in addressing these barriers and what further measures may be required to release current potential in the sector.

2.6.7. The key barriers identified by this project's analysis can be ranked as follows:

[41] Motor Systems Efficiency Supply Curves, UNIDO, December 2010
http://www.unido.org/index.php?id=1000596

Significant barriers which prevent measures in many cases:

- **Risk aversion and uncertainty:** uncertainty about ability to capture the benefit of investment, for example electricity prices mean that the potential savings are hard to estimate and risk averse managers do not want to switch to energy efficiency equipment because of concerns about reliability and compatibility, or more broadly due to wider perceptions of economic risk; and

- **Hurdle rate/payback:** analysis suggests that businesses often do not consider investments with a payback period longer than 2-3 years, valuing short-term investments more than long-term. However electricity efficiency measures may have a longer payback period.

Less significant barriers which prevent measures in some cases:

- **"Not front of mind" (bounded rationality):** where businesses prioritise other issues which are more central to their business or daily life;

- **Capital constraints:** where there is uncertainty about ability to capture benefit of the investment or possibility of incurring additional costs; and

- **Product availability:** where electricity efficiency products are not widely available to users.

Releasing the potential

2.6.8. The Government already has a suite of policies to encourage industrial electricity efficiency[42]. These policies go some way to driving electricity efficiency but there is potential to go further. Based on this analysis, we have considered the following:

- Better information through an information hub and disaggregated metering and/or capacity building measures – to address knowledge gaps and overcome informational barriers;

- Minimum efficiency standards for industrial processes – to overcome many of the key barriers, such as risk aversion and uncertainty, "not front of mind" and lack of information/awareness; and

- A financial incentive for efficiency, which could be delivered through a targeted or market-wide approach – to address the barriers of risk aversion and uncertainty, payback periods, "not front of mind", capital constraints and lack of information/awareness.

2.6.9. As described in the following chapters, we have discounted minimum efficiency standards, but are seeking views on the information approaches described, and a possible financial incentive for industrial efficiency, which could be delivered through a targeted or market-wide approach.

[42] More information on the relevant existing policies can be found in Annex 1

3. Financial Incentives

This chapter considers introducing a new financial incentive to encourage further electricity efficiency, setting out why it might be effective and good value for money, which sectors it might be relevant to and how it might be delivered.

We suggest that a financial incentive might be effective at overcoming the market failures and barriers of split incentives (where the person benefitting from the efficiency measures is different to the one installing and investing in it), "not front of mind", demanding payback periods and risks/uncertainties. We are keen to understand the extent to which financial incentives could overcome these barriers cost-effectively.

Two types of financial incentive are considered:

- a market-wide incentive - potentially open to an unlimited range of efficiency measures and participants from different sectors as long as they can demonstrate efficiency savings; and
- a targeted scheme - where a payment is associated with the purchase of specific energy-efficient equipment and open to limited sectors or groups.

Cost-effectiveness and affordability will play a key role in determining which, if either, approach is appropriate. Views are sought on the suitability and cost-effectiveness of a financial incentive for each of the sectors and, if one is to be introduced, the merits of each form of financial incentive.

The potential mechanism for delivering a market-wide financial incentive is explored, with three options considered:

- **Premium Payment**[43] for electricity efficiency;
- **Capacity Market** – participation of electricity efficiency in the proposed GB Capacity Market; and
- **Energy Supplier Obligation** for electricity efficiency.

Levy funding for any market-wide financial mechanisms would need to come from within the agreed Levy Control Framework and support for these electricity demand reduction measures would need to be traded off against support for other measures. If an EDR measure is included within the capacity mechanism it will be subject to the cost control arrangements for it when they are finalised, according to its design and likely classification.

[43] Also referred to as a Feed-in-Tariff. The term premium payment is used here as it could be that the payment would be made upfront or over a few years if this option is taken forward A Feed-in-Tariff is more commonly used to refer to payments that are made for delivery rather than abatement of energy over a longer term.

Potential Financial Incentives

The opportunity to overcome market failures and barriers with financial incentives

3.1. As described in Chapter 2 of this consultation document, issues with split incentives (between landlord and tenant or different departments within a business), information problems and issues of "not front of mind" (bounded rationality) are the key market failures preventing the further take-up of energy efficiency technologies across all of the sectors. Further barriers include high hurdle rates and the risk and uncertainties associated with introduction of new equipment in an industrial setting.

3.2. This chapter considers how effective financial incentives might be in tackling the barriers to further electricity efficiency, while Chapter 4 considers the contributions to electricity efficiency that could be achieved through other approaches. Key determining factors in our assessment of all policies, including financial incentives, will be the ability to tackle cost-effectively the barriers to further take-up and affordability.

3.3. A financial incentive may be effective in overcoming the key barriers. For example:

- Where business or individuals have considered undertaking electricity efficiency projects and have not proceeded with them because the payback period is too long to justify investment when compared to other priorities. There is the possibility that the incentive could mean that the payback period is shortened and these rejected projects become financially attractive;
- Making the investment worthwhile for the tenant in the landlord/tenant setting where the improved financial terms would increase the chances of an investment paying off during the expected tenancy period;
- For the landlord, making it more attractive for them to make the investment, even if they are not confident in the impact this will have on future rental income; and
- In addressing "not front of mind" (bounded rationality) – the fact that people simply do not pay much attention to these issues when making decisions. The vast array of factors which affect purchase decisions or investment of limited capital means that decision-makers may revert to rule of thumb behaviour or choose a couple of decision criteria, not taking full account of energy efficiency issues. The presence of a financial incentive may attract the kind of Board level interest which anecdotally is key to firms taking action in the efficiency sphere, or increase the importance of this as purchase criteria (though this could also be achieved through other means).

3.4. A financial incentive could potentially overcome some of the more significant barriers to greater efficiency in the use of electricity that are arguably being insufficiently addressed by the status quo. Through this consultation, we are keen to better understand the extent to which financial incentives can overcome the barriers to greater efficiency.

Where could financial incentives be effective

3.5. Based on our assessment of where the gaps are in addressing the market failures and barriers that are preventing widespread take up of electricity demand reduction options, we considered a range of possible financial incentives, including:

- Using a financial incentive to encourage businesses to make their buildings or industrial processes more efficient;
- Using a financial incentive to encourage the purchase of more efficient products – both domestic and non-domestic; and
- Using a financial incentive to maximise the efficiency of domestic homes.

Non-domestic buildings and industry

3.6. Unacceptable payback periods have been identified as a key reason that businesses do not prioritise cost-effective electricity efficiency projects, both in buildings and industrial processes. For marginal investment decisions, financial incentives may tip the payback periods from unacceptable to acceptable, and contribute to a greater proportion of the efficiency potential in non-domestic buildings and industrial processes being achieved.

3.7. Dependent on the approach taken to a financial incentive, it may encourage the replacement of specific equipment directly, or take an approach where the total energy savings across a whole building or process are the key consideration, regardless of the combination of physical or behavioural measures driving these savings.

3.8. There is a risk that a financial incentive in this area duplicates the incentive provided by other energy efficiency schemes such as the CRC Energy Efficiency Scheme, Climate Change Agreements and non-domestic Green Deal. Any new financial incentive would need to avoid adding complexity and rewarding the same behaviour twice.

Consultation Question	
2.	**Do you have evidence on whether offering a financial incentive is likely to be an effective way of overcoming the barriers that prevent efficiency measures being taken up in non-domestic buildings, bearing in mind the policy measures that already drive energy efficiency in non-domestic buildings?**
Consultation Question	
3.	**Do you have evidence on whether offering a financial incentive is likely to be an effective way of overcoming the barriers that prevent efficiency measures being taken up in industrial processes? Explain your point of view.**

More efficient product choices

3.9. A financial incentive to support energy-efficient products, both in the domestic and non-domestic sectors, may be an effective way to overcome barriers. Purchasers are naturally motivated by cheaper purchase prices, even if potentially higher future costs (running costs) might be ignored. In addition, such an incentive could help create markets for new super-efficient products.

3.10. As described in Chapter 5, additionality is a risk of offering a financial incentive in any sector. We consider that additionality concerns may be particularly relevant for product-related efficiency intervention because those taking up the financial incentive may have purchased a high efficiency product without this incentive (known as 'deadweight'). This would mean that the policy has limited additional impact on demand reduction and offers poor value for money.

3.11. It is easier to identify the additionality from incentives for efficiency measures that have long replacement cycles and no obvious trigger to invest – such as home insulation or industrial machinery. However, for products and appliances, which are often replaced every few years without support, a financial incentive is less likely to deliver additional savings.

3.12. Moreover, for products, the additional electricity demand reduction resulting from each purchase of 'best in class' versus its equivalent with average electricity use, will be small. Therefore, the level of support that this saving justifies may not be high enough to trigger the desired change in purchasing behaviour.

3.13. The second risk is that a support for the purchase of a new product may not translate into electricity savings if it simply encourages purchases of more electrical products or larger models than would otherwise have been chosen. This is particularly relevant to the domestic sector. In the case of a scrappage scheme, which actively aims to speed up the replacement cycle, there is also potential for increasing the lifecycle carbon emissions of the products once disposal costs are factored in[44].

3.14. Restricting the range of products eligible under a scheme may help negate some of these risks. For example, any support could exclude the largest models of domestic appliances such as fridge-freezers to ensure that it does not incentivise consumers to 'trade up' to models that are highly efficient but actually use more electricity overall. Or it could limit the inclusion of consumers electronics, such as TVs where households may desire to own two or more of the same product if the price reduces.

3.15. Alternatively, households could be offered a financial incentive based on achieving reductions in their total electricity usage through any combination of purchase and usage of products or other household measures to save electricity, assuming delivery of such a scheme was not too complex. Equally, commercial and industrial businesses could bid into a market-wide financial incentive scheme which goes wider than products.

[44] See evaluation for DECC boiler scrappage scheme run in 2010: EST 'English Boiler Scrappage Scheme 2010, Evaluation Report' February 2011

Case Study: Japan: Eco-Point Scheme (financial incentive)

Under the Eco-Point scheme, which ran in Japan from May 2009 to March 2011, "eco" points were given to those purchasing designated energy-efficient products. Consumers who bought TVs, air conditioners and refrigerators with certain energy efficiency standards obtained 'points' with a value of 5-10% of the purchase price which they were then able to exchange for gift certificates or for goods, including travel and LED lighting and other energy-efficient goods.

The scheme stimulated rapid market uptake of specified energy- and electricity-efficient appliances that is officially estimated to have achieved CO_2 emissions reductions of around 2.7 million t-CO_2/year. Between April-December 2010, energy-efficiency-rated-4 refrigerators accounted for 98% of total sale of refrigerators, energy efficiency-rated-4 air conditioners accounted for 96% of total sale of air conditioners and energy-efficiency-rated-4 TVs accounted for 99% of total sale of TVs (energy efficiency of appliances was rated on a scale of 1 to 5, with 5 the most efficient) [1].

Some of the appliances purchased by households may have been additional rather than replacement appliances or replaced/disposed of prematurely. However, one indirect benefit of the scheme is that it stimulated uptake of LED lighting to 19% of total light bulb sales by volume. From May 2009 to March 2011, the scheme generated a total of 2.6 trillion Yen revenue from sales of air conditioners, refrigerators and TVs, with an economic ripple effect of 5 trillion Yen – seven times the budget for the scheme. The estimated employment retained or produced through the scheme was 320,000 each year.

[1]Source: Ministries of the Environment; Economy, Trade and Industry; and Internal Affairs and Communications http://www.meti.go.jp/english/press/2011/pdf/0614_01a.pdf

Consultation Question	
4.	**Should Government consider a product-specific financial incentive in the domestic sector in spite of the risks and limited potential (23% of domestic product untapped potential as set out in Chapter 2)? If so, how could we design an incentive that would drive better purchasing or usage, rather than early product replacement?**
Consultation Question	
5.	**Would a financial incentive be effective in driving efficient product choices in the non-domestic sector? What evidence is there of this and what are the differences, if any, to the case with domestic products?**

Domestic buildings

3.16. There is extensive support available through Green Deal and Energy Company Obligation for efficiency measures in domestic homes and the overlap with these existing policies would need to be considered carefully before the introduction of additional financial support. The potential for a

scheme focused on behavioural changes is discussed in more detail later in this chapter.

How a financial incentive might be delivered

3.17. If it is decided that an additional financial incentive is the most effective way of overcoming the key barriers, there are a variety of ways in which it could be delivered:

- One approach would be a scheme which is open to a potentially unlimited range of energy efficiency measures and participants as long as they can demonstrate efficiency savings (referred to as a **market-wide financial incentive**).
- Alternatively a financial incentive could take the form of payment which is associated with the purchase of specific energy-efficient equipment or control systems and is only open to certain sectors or groups (referred to as **targeted schemes**).

3.18. Final decisions on the implementation of any financial support mechanism will be taken on the basis of assessment against various criteria including affordability and value for money. Funding for market-wide financial mechanisms would come from within the agreed Levy Control Framework and support for demand reduction measures will need to be traded off against support for other measures.

Targeted Financial Incentive Schemes

3.19. A targeted financial scheme would provide financial support for the replacement of specified technologies with more electricity efficient versions – such as a pump or motor scrappage scheme, or a contribution towards the costs of installing lighting, heating, ventilation and air conditioning controls (HVAC) or LED lighting.

3.20. The scheme would set out who is eligible to apply and a list of eligible products along with criteria for additionality and measurement & verification. One way to maximise the cost-effectiveness of financial support would be to limit eligibility to certain equipment that fulfils certain criteria (e.g. age, performance).

3.21. Eligible participants would apply to a scheme administrator for payment either before or after the installation had taken place. The payment could take the form of an up-front lump sum, a stream of payments or a combination of the two. Targeted schemes most commonly take the form of a single, up-front payment. The payment would be received once the administrator was satisfied that the applicant had met the appropriate criteria.

3.22. A standalone targeted incentive would be attractive if some form of financial incentive is needed to overcome barriers to key areas of efficiency potential but the outstanding efficiency potential is not sufficiently wide-ranging to justify the introduction of a market-wide scheme.

3.23. Examples of potential targeted financial incentive schemes could be:

i. Non-domestic buildings: targeted support for installing measures including lighting controls, HVAC controls, high-efficiency lighting and draft proofing;

ii. Industrial processes: targeted support for specified equipment; and

iii. Domestic and non-domestic products: targeted support to reduce the initial cost of higher efficiency products.

Targeted support for non-domestic buildings

3.24. In a targeted financial incentive for non-domestic buildings, a pre-agreed level of support would be available for a small number of specific interventions – such as installation of lighting controls, HVAC controls, or high-efficiency lighting systems. To ensure that these interventions were appropriate, the support may be limited to properties where these measures had been recommended in an approved assessment or energy audit.

3.25. Early analysis of technical potential suggests that large proportions of the technical potential available in non-domestic buildings could be captured through a few individual measures – notably lighting controls (10TWh projected savings in 2030), HVAC controls (6TWh in 2030) and high-efficiency lighting (5TWh)[45].

3.26. Research[46] carried out with businesses into their views on financial incentives suggests that many businesses like the certainty of a targeted scheme. For example, schemes which have a pre-agreed level of support, which would enable businesses to have greater confidence in making an efficiency investment. However, businesses acknowledged that if a targeted scheme focused on only a few technologies, this would limit the scope and applicability of the scheme, and could disincentivise businesses from taking "whole building" approaches to maximising efficiency.

3.27. If a targeted financial incentive were available in the non-domestic sector, potential conflict with support for businesses under the Green Deal would be a key concern and would require careful design to ensure the interactions are well managed and the two policies do not duplicate.

Consultation Question	
6.	**If a targeted financial incentive for non-domestic buildings were available, which efficiency measures should be a priority for the scheme? What evidence is available to support your view?**

[45] *Capturing the full electricity efficiency potential of the UK,* July 2012, figures for retrofit lighting and HVAC controls and CFL to LED lighting plus conversion to T12/T8 lighting, including commercial, industrial and public sector buildings

[46] "Exploring the design of policies to increase efficiency of energy use within the industrial and commercial sectors"

Targeted support for industrial processes

3.28. The Enhanced Capital Allowance (ECA) scheme for energy-saving technologies[47] is already in place to enable businesses to claim a 100% first year capital allowance on investments in certain energy-efficient equipment, against the taxable profits of the period of investment. It complements the Ecodesign regulation in that it strives to encourage the uptake of the top energy-efficient products whereas the regulation strives to ensure withdrawal of inferior products.

3.29. A targeted financial incentive, alongside existing ECAs, could be used to increase the rate at which industrial pumps, motors or other key equipment is replaced. Replacing old pumps and motors with newer versions is likely to result in improvement in the average energy efficiency of industrial processes and so reduce electricity demand.

3.30. A number of factors need to be considered for a scrappage scheme, in particular its delivery model, eligibility criteria, duration and level of support. For example the scheme could be Government or industry-led through a voluntary agreement between Government and equipment manufacturers and retailers. Each design would raise different issues in terms of deliverability, funding and risks. Other issues include how a scrappage scheme would complement existing regulation, for example the Ecodesign regulation for motors[48] and the lifecycle balance between reusing existing equipment or recycling and replacing it with more efficient equipment. The latter may be less of a risk in industrial processes than elsewhere due to the generally longer lifecycle of components than other sectors. It could also be managed by criteria such as a minimum age for the components.

3.31. There is a risk that both the use of ECAs and any new targeted financial incentive may result in the replacement of individual components with more efficient models, but without consideration of whether greater gains could be made by considering how the system is configured, or re-sizing the pump.

Case Study: New York State – rebates to encourage energy efficiency

New York State runs a scheme aimed at encouraging efficiency improvements in electricity use, natural gas use, information technologies, operational processes, and industrial processes. Under the scheme pre-qualified equipment and performance based rebates are offered on a per kWh (for electricity) or per MMBTU (for gas) reduced basis to in-state institutions that reduce their electricity or gas use. Projects with a simple payback greater than 18 years or less than 6 months are not eligible. The scheme is funded by a levy on utility bills (a systems benefit charge) and only those customers who pay the charge are eligible for support.

The kinds of projects that qualify include: facility improvements e.g. energy-efficient lighting, motors; process improvements such as scrap reduction, throughput

[47] http://etl.decc.gov.uk/etl/default.htm
[48] Commission Regulation (EC) No 640/2009, of 22 July 2009, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:191:0026:0034:EN:PDF.

increases; and operational improvements (e.g. burner maintenance, process controls optimization etc).

Rebates for energy reduction are: electric efficiency: $0.12/kWh to $0.16/kWh; gas efficiency: $15/MMBtu to $20/MMBtu; and operational changes: $.05/kWh (electric) and $6/MMBTU (gas). Incentives are paid based on one full year of energy savings: 60% of the incentive when installation is complete, the remaining 40% when savings have been measured and verified.

Energy savings incentives are based on one full year of energy savings.

The energy savings during 2010 for projects completed in 2010 totalled 365,150 MWh, helping customers reduce their operating costs by over $40 million.

Consultation Question	
7.	**Do you consider a targeted financial incentive an effective way of encouraging higher and additional efficiency in industrial processes? Which efficiency measures should be a priority for any scheme? What evidence is available to support your view?**

Targeted support for efficient products and appliances

3.32. A targeted incentive for stimulating further electricity demand reduction through more efficient products in the domestic sector could work in a number of ways. One is via a rebate or certificate at the point of sale highlighting to the consumer that support is offered on the basis of the product's energy efficiency. This has two advantages:

- Given the prevalence of information and bounded rationality barriers in the uptake of efficient products, the voucher or certificate highlights more efficient products and that efficiency is a purchase consideration. Rebates demonstrate support more obviously than one hidden in a reduced purchase price. This could stimulate a better response than 'hidden' mechanisms such as feebate[49] programmes or retailer discounts paid for via the market-wide financial incentive.

- Consumers tend to have very high implicit discount rates – they value a saving today much more highly than a saving spread over time. So the amount of support necessary to promote an efficient purchase would be less if it is given at the point of purchase rather than spread over time.

3.33. However, any approach of subsidising the purchase price of efficient products has potential downsides:

[49] Feebate is a portmanteau of "fee" and "rebate". They are self-financing systems of fees and rebates that aim to incentivise more efficient products in a revenue neutral way

- There is the risk that support encourages households to purchase bigger products than they otherwise would have done;
- If support is enough to trigger a purchase (as can be the case with generous scrappage schemes) it may have perverse outcomes from the lifecycle carbon emission costs for the disposal of the additional 'scrapped' products.
- The potential administrative cost of setting–up and managing a scheme due to the large number of products sold each year, and the relatively small absolute electricity saving from each, could prove disproportionate.

3.34. Therefore, any support offered for domestic products would have to meet strict criteria to ensure additionality and be structured so that consumers are fully aware of the reasons they are being offered this support to overcome 'bounded rationality'. At this stage we have also excluded delivering support via a scrappage scheme because of the risk of deadweight and impact on lifecycle costs.

3.35. However, given the possible size of the savings and costs, we would welcome further evidence as to whether support for energy-efficient products in the domestic sectors offers sufficient benefits to merit further work.

3.36. Many of the opportunities and risks of these schemes are the same for the domestic and non-domestic sectors. However, the non-domestic sector does have some unique characteristics that are worth noting:

- Economies of scale – organisations vary in scale, but may replace significant quantities of appliances at once. If the combined savings for a company are significant they may take action even if the savings per unit are small. This may have positive value for money implications for larger schemes, or alternatively reduce the additionality of the scheme as the efficient purchases would be more likely to have been made anyway;
- Split incentives – this barrier particularly relates to the different responsibilities for budgets within an organisation. Split incentives may lead to purchasers placing disproportionate emphasis on ensuring point of sale benefits - because longer term benefits, such as a voucher redeemable against electricity costs, may not be influential on the purchaser. One option to overcome this may require businesses to sign up to the incentive in advance so that purchasers can be given a clear steer to prioritise electrically efficient products and appliances.

Consultation Question	
8.	**Should Government consider a targeted financial incentive to support the purchasing of higher energy-efficient products? How could the efficiency of such a scheme be maximised?** **Would a voucher or certificate scheme work? If not, what other options should we consider?** **Please make clear in your response whether you are referring to the domestic or non-domestic sector or both.**

Market-wide financial incentives

3.37. A market-wide incentive would aim to drive cost-effective efficiency in multiple sectors of the economy. There are a number of benefits of a market-wide approach, which are broadly applicable to all sectors:

- Demand reduction could be sought from a variety of sectors, which can compete against each other to provide demand reduction measures at least cost; encouraging innovation, driving down costs and tapping the maximum potential;

- The scheme could be flexible to adapt to the sectors and technologies with the highest potential for cost-effective savings as these change over time; and

- Project developers could focus on the primary goal of reducing electricity use through projects (bespoke or more standardised) that best fit their business need rather than being rewarded for the installation of a specific technology, but not the resulting energy savings, as with a targeted financial incentive.

3.38. A market-wide scheme could include elements of a number of the targeted financial incentive schemes described above.

3.39. A market-wide financial incentive could have a role in all sectors and this consultation seeks further evidence on the potential and cost-effectiveness for all sectors. A market-wide incentive may have greatest impact in industrial processes where the barriers presented by payback periods and risk aversion may be more effectively overcome by a market-wide financial incentive. It may also be particularly relevant to non-domestic buildings where the barriers, such as split incentives and payback periods, are less well addressed through other mechanisms. For example, as set out earlier in this chapter, a financial incentive may mean an investment pays off during an expected tenancy period.

3.40. However, there is a strong argument that domestic buildings should be excluded from a market-wide approach given the extensive support available through the Green Deal and Energy Company Obligation. We consider that there would be too much overlap with existing policies to allow building measures in homes (such as the installation of insulation) to be rewarded.

3.41. Despite this, as discussed in Chapter 2, there may still be potential for reductions in electricity demand through household energy use behaviour. The roll out of Smart Meters will provide consumers with better information about how they use electricity in the home. Smart Meters also provide the opportunity for new behavioural interventions. For example, there may be scope for energy companies or third parties to encourage consumers to be more efficient in the way they use their home and appliances, which could be driven though innovative communication combined with tailored behavioural change recommendations. Organisations that are able to demonstrate they

delivered verified electricity demand reductions on a whole-house basis could be eligible for financial payments through a market-wide financial incentive.

3.42. All of the schemes set out below could either allow all electricity efficiency measures to participate or focus on those with the highest potential to ensure the funding is targeted where it will have the greatest impact. This may be desirable to ensure the measures being carried out are both 'additional' and cost effective. However, a process of competitive auctioning could ensure that only the more cost-effective projects are taken forward, even if all forms of project are technically eligible for the scheme. If there was a desire to run a targeted scheme, such as a scrappage scheme, an organisation could in principle bid into the market-wide mechanism for funding to operate this.

Energy services companies (ESCOs)

Energy services companies (ESCOs) can provide a wide variety of services to customers, helping them to reduce their energy use and reducing energy costs. For example, a contract might be agreed where the energy bill saving realised as a result of the installation of energy efficiency measures are split between the ESCO and the client. If the amount that the client pays for its energy is fixed, then it is the ESCO that takes on the performance risk of the measures undertaken. Although the ESCO market has had success in other countries, with the US market being estimated to be worth over $5 billion in 2011[1], it is less developed in the UK.

A broad financial incentive could create a further income stream for ESCOs to drive efficiency. In particular, an opportunity may exist for ESCOs or other aggregators to combine smaller scale projects to qualify for a financial incentive – such an approach might enable barriers to be cost-effectively overcome in a broader range of settings.

[1] The U.S. Energy Service Company Market, Pikes Research, January 2012: http://www.pikeresearch.com/research/the-u-s-energy-service-company-market

3.43. Participation would be open to all who can meet the required criteria and are above the set *de minimis* level. In practice this could mean that if the scheme applies to them, domestic customers and smaller businesses may better participate through an aggregator, energy service company or as a community group. Analysis suggests small companies were most interested in a financial incentive which involved ESCOs and had no upfront costs. They felt this would tackle capital availability and payback barriers, although some were concerned about whether they could trust third parties[50]. Larger companies may also choose to participate through such third parties to minimise the need to have

[50] Exploring the design of policies to increase efficiency of energy use within the industrial and commercial sectors

in-house expertise. Some examples of measures that might be rewarded under possible mechanisms are:

- an industrial business which optimises their processes and upgrades their systems to make savings across one or more sites;
- a supermarket chain which replaces refrigerators across all or part of their business with more efficient models;
- an owner of an office block rented to a number of different people who installs lighting and air conditioning control systems throughout the building.

Case Study: US Opower Home Energy Reports: social norms and energy saving tips help drive a reduction in energy consumption

1. In the US, Opower partners with utility companies to help consumers reduce their energy consumption by sending consumers regular home energy reports that compare their energy usage with comparable neighbours and provides tailored energy conservation tips. The scheme is based on evidence which suggests that the use of social norms can help drive behaviour change by showing people how they compare against their peers.

2. Each home energy report shows historical energy use for the household and how this compares against their average neighbour and most efficient neighbours. Ratings are based on performance relative to approximately 100 comparable homes similar in size and heating type in the area. Households receive a 'great' rating if they use less than their efficient neighbour comparison group, a 'good' rating if they use less than average and 'below average rating' if they have higher than average consumption.

3. The second part of the report provides tips for energy consumption that are tailored to each customer based on their historical energy use and demographic characteristics e.g. if their energy use was relatively high the previous summer they are more likely to receive suggestions for purchase of energy-efficient air conditioners.

4. Allcott (2011)[1] conducted a study of the impact of Opower schemes in the US involving 600,000 households and concluded that the scheme reduced energy consumption by around 2% on average and had an average cost effectiveness of 3.3 cents per kilowatt-hour. Opower and First Utility launched a trial of the scheme in the UK in June 2012, though results are not yet available.

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[1] *Allcott, Hunt, October 2011. "Social Norms and Energy Conservation." Journal of Public Economics, Vol 95 (9-10), pp. 1082 - 1095.*

Consultation Question	
9.	**What restrictions, if any, should there be on which sectors and measures are eligible to participate in a market-wide scheme? Please explain.**

Delivering a market-wide incentive

3.44. If further analysis suggested this was a cost-effective policy and decision were taken to implement a new market wide incentive, the core options for delivering it could be:

- **Premium Payment**[51] for electricity efficiency;
- **Capacity Market** – participation of electricity efficiency in the proposed GB capacity market; and
- **Energy Supplier Obligation** for electricity efficiency.

3.45. If such a scheme were to be implemented, there are a number of detailed decisions to be taken, some of which are outlined below. There would be the opportunity for further input as these were developed for any scheme to be put in place.

3.46. In each scheme, it is assumed that financial support could be made available for a wide range of projects that can demonstrate real and additional savings in electricity (measured in kWh). These schemes would provide financial support to such projects, proportional to their energy savings.

3.47. Measurement and verification, which accurately proves the kWh savings from an individual efficiency measure (for example, installing lighting controls) would be important to all approaches. Similarly, strict standards of additionality would be required to ensure that support is only provided to projects that would not have happened without it. Measurement, verification and additionality requirements are explored in more detail in Chapter 5.

Case Study: Texas: Standard Offer Programmes

In the State of Texas, Utility Companies (the US equivalent of UK electricity companies or suppliers) are required to meet at least 20% of their annual growth in electricity demand through energy efficiency programmes. To meet these targets, Utility Companies have implemented a combination of Standard Offer Programmes and Market Transformation Programmes, delivered by third party 'project sponsors', which can include energy service companies, contractors, design firms, commercial customers and property developers. In 2010 these programmes achieved 533 gigawatt hours (GWh) of electricity demand reduction.

The Standard Offer Programmes offered within this scheme bear some similarity to a Feed in Tariff for electricity efficiency measures. In these programmes, Utilities offer a pre-agreed rate of payment (on a cents per kWh or per kW basis) for a range of efficiency projects. Deemed values are calculated in advance for the savings each efficiency project is expected to achieve.

[51] Also referred to as a Feed-in-Tariff. The term premium payment is used here as it could be that the payment would be made upfront or over a few years if this option is taken forward. A Feed-in-Tariff is more commonly used to refer to payments that are made for delivery rather than abatement of energy over a longer term.

Within this scheme, the level of support provided for individual measures is set administratively, based on an assessment of the avoided costs that will result from the measure. In 2010, 64 GWh savings were achieved in commercial projects (such as replacing chillers and lighting equipment), 12 GWh in residential and small commercial projects (where contractors install energy-saving measures in homes and small businesses), and 22 GWh in "hard-to-reach" projects in low-income homes.[1]

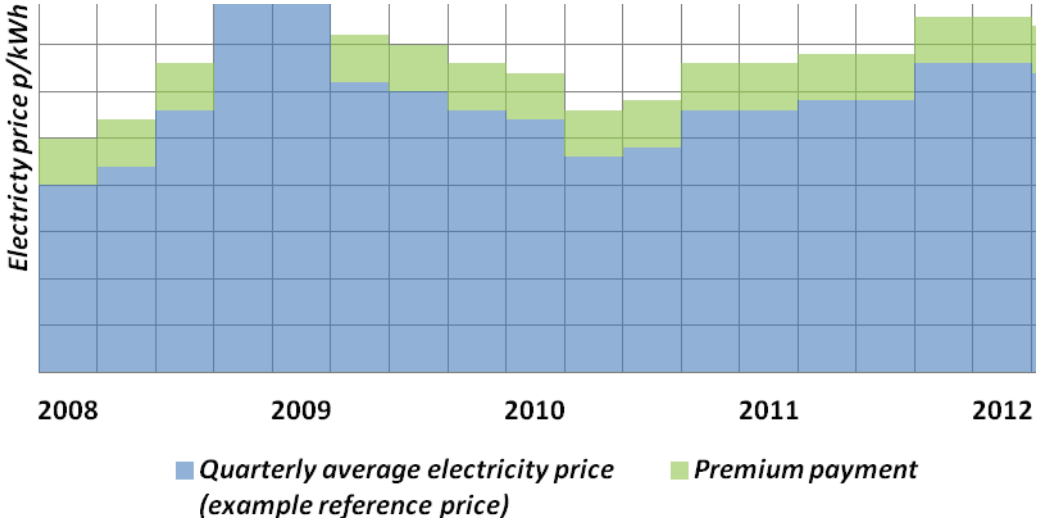
[1]Capturing the full electricity efficiency potential of the UK, Analysis undertaken with McKinsey, July 2012

Electricity Efficiency Premium Payment

3.48. A feed in tariff with contracts for difference (CfD) is being put in place under Electricity Market Reform[52] to encourage investment in low carbon generation through increased revenue certainty. A similar option for taking forward a market-wide financial incentive could be through an electricity efficiency premium payment. This would provide participants with a payment on top of the savings that result from reduced use of electricity. There are two ways this potentially could be done:

- Simple premium payment in which electricity demand reduction (EDR) providers receive an agreed flat fee payment for every kWh saved for an agreed level of savings, on top of the savings they make from the avoided use of electricity.

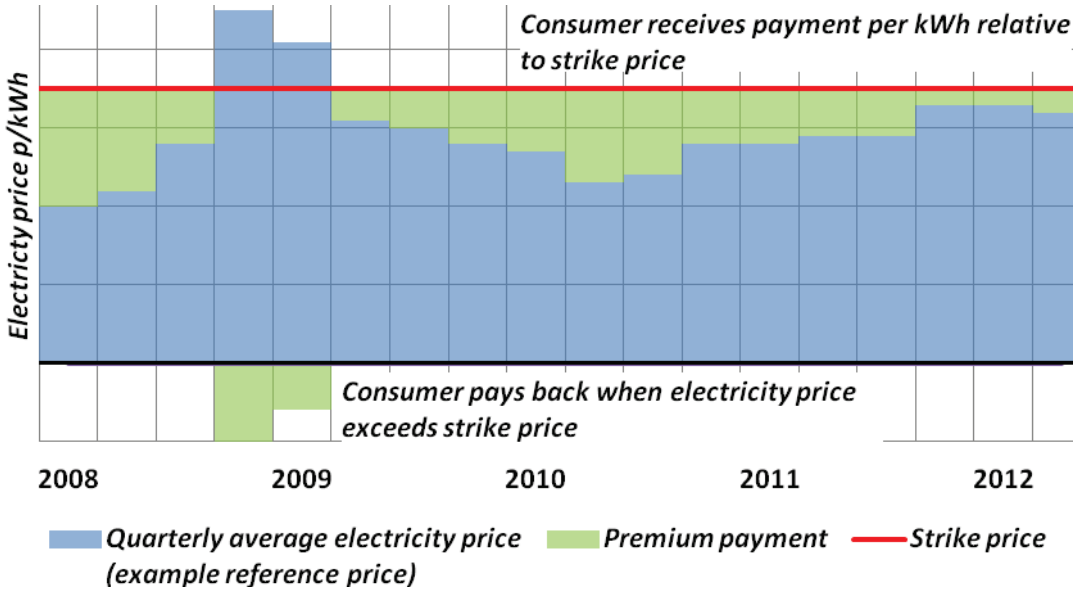
Simple Premium Payment



[52] For more information see http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx

- Premium Payment with a Contract for Difference (CfD) in which EDR providers receive a payment to top the electricity price determining bill savings up to an agreed level (strike price) for every kWh saved. Where the electricity price exceeds the strike price, EDR providers would be required to pay back part of their savings from avoided electricity to manage the overall costs of the scheme. A nominal electricity price would need to be determined to calculate top up and claw back payments (a reference price).

Premium Payment with a Contract for Difference (CfD)



3.49. The CfD approach provides certainty to EDR providers over future wholesale electricity prices and may de-risk investments by ensuring a consistent level of savings against their investment. However initial research suggests that forward price volatility is less important to those making decisions on efficiency investments than investors in generation. This could be because most customers, aside from the highest electricity consumers, will have minimised their exposure to the volatility seen in the wholesale electricity price through the choice of a more stable retail electricity price. Retail customers will see changes in their electricity price as steps up or down at a significantly lower frequency than in the wholesale market. A variable stream of payments linked to energy price was also felt to bring uncertainty and complexity though a changing level of support[53].

3.50. While identifying an appropriate reference price would be challenging and is likely to add complexity, potentially deterring participants, a CfD approach would serve to limit the amount of support that is payable. Unless capped in some way, a simple premium payment would continue to pay participants even

[53] "Exploring the design of policies to increase the efficiency of energy use within the industrial and commercial sector"

if the electricity price reaches a level at which the investments would have been made without further financial support. The simple premium payment is likely to be more straight-forward for customers to engage with but the CfD could provide better value for money if prices rise.

3.51. The ambition and limits of such a scheme could be determined by setting either or both of a cost or volume envelope, based on projections of likely uptake. The price per kWh EDR project providers would receive would be determined in auctions to drive value for money. EDR providers would participate in auctions run by a central body, which in addition to running the auctions would put the contracts in place and potentially also make the payments to participants. Verification of the measures in line with Government established Measurement, Verification and Additionality requirements could be carried out by the scheme operator or a separate regulatory body to ensure cost-effectiveness. (See Chapter 5).

Case Study: Switzerland ProKilowatt study: financial incentives to improve energy efficiency

The ProKilowatt scheme provides financial incentives to reduce energy consumption, with a focus on electricity savings. The project provides funding for projects through an auction process to identify those with the best cost/benefit ratio. The scheme's aim is to realise efficiency projects that would not pay for themselves purely through the energy savings made (i.e. if the payback period for appliances is greater than 5 years or for infrastructure greater than 8 years). Support increases proportionally to the increase in payback time (20% support for payback time of 5 years, going to 40% for payback time of 9+ years).

Businesses, industry, municipalities and other bodies can apply and any project or programme that is aimed to reduce energy or electricity consumption is potentially eligible. Examples of measures that received funding through the scheme include lighting, cooling and mechanical process (e.g. city lighting using light sensors in a small town).

The Ministry for Energy leads on the programme but the tendering process is handled by a private company. Tenders are scrutinised by a panel of experts who will assess the costs and savings of the scheme and select those that have the best payback.

111 bids were successful in the November 2011 tender with around £20m of funding provided through the scheme. Most businesses received support of 0.029 Swiss Francs per kWh saved, with support reaching up to 40% of a business investment into energy saving. Altogether, ProKilowatt realised around 598 GWh of energy savings in 2011.

3.52. Following an assessment of cost-effectiveness and affordability, if a premium payment is to be taken forward, a number of decisions would need to be made, including:

- whether a **simple premium payment or CfD** should be taken forward;
- **the design of the auction**. For setting the level of the premium payment top up or strike price;
- **when and for how long payments are made**. This could be upfront, a stream of payments or a combination of both;
- **who operates the scheme and carries out the Measurement, Verification and Additionality**. This may be one or more organisation chosen for synergies with their other roles;
- the **reference price** if a CfD were taken forward. It is likely to be very challenging to identify a price which is robust, durable, achievable and credible as there would be significant variation between the price that different customers pay;
- the **appropriate Measurement, Verification and Additionality regime**, which is discussed in more detail in Chapter 5;
- the **cost and volume constraints** on the scheme to manage the impact on customers' bills, assure continued value for money and protect security of supply; and
- the **penalty regime** for non-compliance.

Capacity Market

3.53. The Government is taking powers to introduce a Capacity Market, if required, under Electricity Market Reform[54]. The objective of the Capacity Market is to ensure there is enough reliable capacity on the system to meet demand. The Capacity Market works by putting in place agreements under which capacity providers guarantee to provide a volume of capacity, or face financial penalties.

3.54. The Capacity Market is currently planned to allow capacity to be provided by generation, demand side response (DSR) [55] and electricity storage. It could be extended to include permanent demand reduction delivered through electricity efficiency measures. This could involve efficiency schemes offering their measures alongside generation or DSR in any future capacity auction. The bids to permanently reduce the level of demand would be deemed to be offering capacity equivalent to generation capacity.

3.55. The activities for participants and the scheme operator would be likely to be similar to those of the premium payment set out in paragraph 3.48. And as

[54] For more information see: http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/electricity/electricity.aspx

[55] Demand Side Response (DSR) is the collective name for a range of actions that decrease or, more rarely, increase electricity demand temporarily to help balance the system. Typically these involve time switching (such as running industrial processes at other times of day to avoid peaks), turning demand down (such as reducing air conditioning loads) and switching to behind the meter generators to reduce demand on the grid.

with the premium payment the ambition and limits of the scheme could be determined by setting both a cost and capacity envelope and using auctions to drive competitiveness between the projects.

Case Study: Energy Efficiency in ISO New England's Forward Capacity Market

In New England, financial support for energy efficiency projects is available through a **Forward Capacity Market**. The system operator, ISO New England, forecasts the peak capacity needs of the electricity system three years in advance and holds annual auctions to purchase the electricity resources that will be needed to satisfy the requirements of that delivery year three years hence. In addition, reconfiguration auctions are held closer to real time to allow the fine-tuning of the procured capacity levels.

Both demand-side response providers and energy efficiency providers are able to participate in these auctions alongside traditional generation providers, subject to meeting the extensive monitoring and verification criteria.

The three-year lead time from auction to delivery period allows generators to construct new plant, and for efficiency providers is more likely to involve beginning to implement measures to ensure the full capacity savings are active at the point of entering the delivery year. Providers choose delivery periods of one to five years as a part of their auction bid and receive a guaranteed price for that duration, regardless of subsequent clearing prices: this allows efficiency providers with a five-year long efficiency project a guaranteed level of support throughout the period of the project.

Analysis demonstrates that energy efficiency projects are playing a growing role in these auctions: on the first auction in 2008, 655 MW energy efficiency projects cleared the auction (between 1 and 2% of total procured capacity), but this gradually increased to 1167 MW in 2010. **Efficiency Vermont** is a not-for-profit state wide energy efficiency organisation, and one of the largest providers bidding efficiency projects into the ISO New England auctions. Efficiency Vermont projects funded through the auction have included residential and commercial lighting projects and HVAC projects.

3.56. As with a premium payment there would be a number of considerations for such a mechanism, including:

- **timing of the first capacity auction**;
- the **difference in timeframe** in constructing generation stations (four years plus) and organising efficiency schemes (within a year) and therefore the appropriate timing of capacity auctions for the respective providers;
- the **period of time efficiency savings are recognised for** before becoming part of the baseline;
- the challenge of **monitoring and verifying** whether energy efficiency improvements are achieved – in particular, in agreeing the baseline

against which they should be assessed, and how successful implementation is measured and assured.

- the **cost and volume constraints** on the scheme to manage the impact on customers' bills and protect security of supply.

Energy Supplier Obligation for Electricity Efficiency

3.57. Supplier obligations are an alternative route to create demand for EDR measures. Energy efficiency obligations on energy companies have been used to drive energy efficiency in the domestic sector in the US and European markets including the UK. Legislation for the Energy Company Obligation (ECO), which will become the primary domestic energy efficiency obligation placed on energy companies in Great Britain, was laid on 30 October and will come into force by the end of 2012[56]. We will learn from the experience of this new obligation when considering whether a supplier obligation for electricity demand reduction could be appropriate for the non-domestic sector.

3.58. In principle an obligation could be placed on energy suppliers to deliver a specific target of electricity demand reduction. There are a number of ways in which energy supply companies could fulfil an obligation, including:

- working directly with customers to support them implementing efficiency measures;
- contracting to a third party company which works with customers to identify eligible measures; and
- run periodic auctions into which third party organisations and individual companies can bid.

3.59. An independent central body would need to be put in place to verify allowable measures in line with any scheme's Measurement, Verification and Additionality requirements. Suppliers could then either implement their preferred measures from a list or they could be required to purchase certificates which EDR providers are issued with and which relate to the volume of demand reduction they have committed to.

3.60. Under a certificate scheme, certificates could be issued per MWh of savings, which EDR providers could then trade in an open market, bilaterally or through auctions from which they would receive payment in the form of a lump sum, income stream or combination of the two. Due to the potential for a wide range of measures and participants in the scheme and to allow the scheme to be responsive to new measures, the traded certificate scheme has attractions. The inclusion of a trading mechanism could help to keep the cost of measures competitive and minimise the burden on customers.

3.61. It is anticipated that a wide range of companies and organisations would be able to undertake projects, designed to achieve significant reductions in electricity demand, that could be counted by suppliers towards their electricity

[56] More information on ECO can be found at: http://www.decc.gov.uk/en/content/cms/tackling/green_deal/gd_quickguides/gd_quickguides.aspx

demand reduction obligation. A penalty would be imposed on suppliers who fail to purchase sufficient certificates to meet their obligation.

3.62. The placing of an obligation on suppliers could drive an approach of securing projects at least cost although there are risks of expensive projects being commissioned if the obligation is set at too high a level. The impact on consumer bills will need to be carefully considered.

3.63. This approach is likely to seem very similar to customers who implement EDR projects on the ground as the premium payment option described above, although most likely with interactions with a different organisation.

Case Study: Italy: Supplier Obligation using White Certificates

Energy Company Obligations with traded certificates have been used in Italy and France. In Italy, from 2005 the *Titoli di Efficienza Energetica* (TEE) energy efficiency obligation has allowed suppliers to meet energy efficiency targets by purchasing tradable certificates.

The Italian Regulator (*Autorita per l'Energia Elettrica e il Gas* – AEEG) is responsible for awarding certificates to eligible projects. AEEG also defines centralised administration and technical rules, and measurement and verification requirements. Any accredited efficiency provider can be awarded these certificates, subject to providing suitable documentation – including demonstrating that M&V standards have been met.

Once issued, White Certificates are traded either bilaterally, or on a bespoke marketplace operated by the Electricity Market Operator. Suppliers can also implement projects directly, or jointly with third party companies, to meet their required targets. Early analysis of the scheme suggested that non-traded routes were preferred, with only 20% of certificates traded in 2005 – although later evidence suggested the proportion of certificates traded has increased through time, allowing access to new market participants such as Energy Service Companies.[1]

[1]Sources:http://www.worldenergy.org/documents/white_certificate.pdf; http://www.cee1.org/eval/db_pdf/613.pdf

3.64. There would be a number of considerations if taking the scheme forward. These include whether to implement a straight obligation or a traded certificate scheme; when and for how long payments are made, and whether this needs to be specified or could be agreed during the trading of certificates; the cost and volume constraints on the scheme to manage the impact on customers' bills, and protect security of supply; how regularly the obligation placed on suppliers is reviewed; who the obligation should apply to; and the penalty regime for non-compliance.

How the schemes compare

Differentiating between a targeted and market-wide incentive

3.65. Targeted and market-wide financial incentive schemes may be effective in overcoming similar barriers but will drive different outcomes. A key rationale for implementing a targeted mechanism may be if a financial incentive were believed to be effective, but only in a few discrete sectors and areas of technical potential. In this instance, a targeted incentive scheme with more limited administrative burden may be the most cost-effective route.

3.66. Targeted schemes may be more appealing to participants due to their potential to be simpler and many participants' preference to know in advance the level of support they can receive for a specific efficiency measure. However, there are some concerns that they do not necessarily encourage electricity savings, just the purchase of a piece of equipment. Market-wide incentive schemes could do this more effectively by being based on electricity consumption savings rather than solely the replacement of individual products.

3.67. Innovation may more effectively be encouraged through market-wide incentive schemes as well as a result of participants being less restricted in the measures they can take to drive electricity efficiency. This includes the ability to drive efficiency through less tangible approaches, including optimising processes and behavioural change. Market-wide schemes are also likely to be more adaptable to changing technologies and approaches.

3.68. In analysis carried out in support of this work, an upfront lump sum payment as often seen with targeted schemes was preferred by medium size businesses and landlords, partly because it was simpler than some of the alternatives presented. A financial incentive with payments over time as often seen with market-wide schemes was considered the least attractive option by respondents, who were not supportive of the complexity of the scheme. They were concerned about how savings would be measured and that a stream of payments over 4-6 years would be less effective at bringing forwards investment, given payback requirements of 1-3 years. Those that were interested were typically larger users or landlords who expected to be in (or own) their property for a longer period of time[57].

Consultation Question	
10.	**What are your views on the comparative merits and disadvantages of targeted financial incentive schemes and market-wide ones? Please explain your response.**

[57] "Exploring the design of policies to increase the efficiency of energy use within the industrial and commercial sector"

Differentiating between different market-wide mechanisms

3.69. There are a number of similarities between the different market-wide mechanisms and there are challenges around the design of each of them. The Measurement and Verification regime and Additionality tests are likely to be similar between the three and would be important in ensuring energy security.

3.70. Any possible additional scheme must fit with other policies to avoid rewarding participants twice for the same activity. These include the CRC Energy Efficiency Scheme, Climate Change Agreements, Energy Company Obligation, Green Deal and also schemes setting minimum standards that are outlined in this paper. They should also fit well with the mandatory audits that are being introduced in 2014 in line with the requirement in the EU Energy Efficiency Directive and a link could be made between the two.

3.71. There are also differences that will help determine between the mechanisms and these include:

- The relative levels of complexity of the different schemes;
- Clarity over the level of payments in advance of participation;
- Who operates the scheme;
- The relative penalty schemes;
- Whether the level of payment differs between the schemes; and
- How and when the payments are made.

Consultation Question	
11.	**Should Government consider a market-wide financial incentive to support further electricity efficiency measures? Please explain your response.**
Consultation Question	
12.	**What are the key elements of a financial incentive scheme to encourage participation? Including but not limited to payment level, length of payback period, who manages the scheme, whether the level of payment is known upfront or determined through the sale of a certificate. Please provide evidence to support your views and reference relevance to the different sectors as appropriate (domestic buildings and products, non-domestic buildings and products and industrial processes).**

Issues common to all schemes

3.72. There are a number of issues common to all financial incentive schemes. These include:

- Payment, Funding and Distributional impacts;
- Piloting;
- Measurement, Verification and Additionality (described in Chapter 5); and
- State Aid compliance.

Payment, Funding and Distributional impacts

3.73. In each of the financial mechanisms the level of support for any project should just be enough to tip investment decisions from unattractive to attractive and should be demonstrated to be cost-effective. An assessment of the required level of payment would need to be made. Costs include:

- the actual costs of installing efficiency measures (the cost of purchasing hardware, assessing wider system requirements and paying internal or external staff to install and maintain the equipment or system); and
- the hidden costs of installing efficiency measures (providing access to contractors, shutting down buildings during work, interference with business).

3.74. We propose competitive auctions would be suitable for all of the potential market-wide mechanisms. This would allow competitive price discovery for the volume of electricity demand reduction sought. If administrative price setting is proposed for a targeted mechanism further consideration would need to be given to the level of support that would achieve those goals.

3.75. Levy funding for any market-wide financial mechanisms would need to come from within the agreed Levy Control Framework and support for these electricity demand reduction measures would need to be traded off against support for other measures. If an EDR measure is included within the capacity mechanism it will be subject to the cost control arrangements for it when they are finalised, according to its design and likely classification.

Piloting

3.76. It will be important to test the likely impact of any financial mechanism prior to full roll-out and to understand the practicalities associated with implementing the scheme. If a financial incentive is taken forward, a pilot or series of pilots could be developed to test key elements of the proposed policy in line with Government good practice including the Magenta Book and the Cabinet

Office's Behavioural Insights Unit guidance. This would ensure the final design is fit-for-purpose and maximises positive impact[58].

State Aid Compliance

3.77. The Government is mindful of its obligations under EU law, including compliance with EU State Aid rules. In taking any policies forward the Government will take full and due consideration of these rules, engaging with the European Commission and others as necessary.

Consultation Question	
13.	**Do you have any other views or evidence on the relevance of a financial mechanism not captured by the questions above?**

[58] **Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials,** http://www.cabinetoffice.gov.uk/resource-library/test-learn-adapt-developing-public-policy-randomised-controlled-trials

4. Opportunities for additional policy: information schemes, voluntary agreements, minimum standards and loans

This chapter outlines options to drive additional electricity demand reduction without providing a direct financial incentive. It considers options for driving efficiency savings through better labelling and information, voluntary efficiency schemes and agreements, minimum efficiency standards, and loan schemes.

The chapter describes a number of new policies under development that seek to drive efficiency in this way – in particular the requirement for all privately rented housing and commercially rented property to meet minimum efficiency standards by 2018 (conditional on there being no net or upfront costs to landlords), new funding for efficiency projects through the Green Investment Bank and Non-Domestic Green Deal, and the periodic energy audits for large businesses required by the EU Energy Efficiency Directive. These policies are anticipated to drive significant electricity demand reduction.

We have considered opportunities to go beyond these existing policies and drive additional electricity demand reduction. We are seeking views on the following additional policy initiatives, which are described in this chapter:

- A Buyer's Commitment to buy high-efficiency products and appliances;
- Additional labelling for non-domestic appliances and products;
- An industrial Processes Information Hub; and
- Government support for disaggregated metering

We are keen to understand whether respondees believe these schemes would be effective additions to the policy landscape. We also welcome views on other proposals for policy instruments which respondees feel may be effective in addressing the remaining gaps, as well as wider views on how the policy landscape could be simplified or streamlined whilst continuing to deliver effective electricity demand reduction.

4.1. Following the sector by sector analysis described in Chapter 2, a number of policy approaches have been identified. This chapter describes policy approaches that seek to drive efficiency without providing a direct financial incentive – including information schemes, voluntary agreements, minimum efficiency standards, and access-to-finance schemes.

Information policies

4.2. Imperfect information is a barrier to electricity efficiency measures, and policy approaches which aim to drive uptake of efficiency measures by providing information have been identified in each of the sectors considered.

Product information

4.3. The requirement for retailers to provide information on products' (domestic and non-domestic) energy efficiency are set out in the EU Labelling Framework Directive. This Directive requires certain products sold in the EU to include energy efficiency ratings at the point of sale, based on a standardised formula that gives certain products a relative ranking (formerly the A to G label, classes have now extended to A+, A++ and A+++).

4.4. The starting point for any such policy is therefore further engagement at an EU level. The UK is committed to ensuring that the EU brings forward cost-effective but rigorous standards for labelling based on evidence, including an assessment of consumer affordability (across the total life cycle of the product)[59] and the impact on business. The EU Labelling Framework Directive has less extensive coverage in the non-domestic sector than for domestic products and appliances. The Government will continue to push the EU to extend the Directive to more commercial products where evidence suggests this would be appropriate and cost-effective.

4.5. We will continue to explore ways to encourage the uptake of the most efficient products. For example, we are considering policies to provide, on a voluntary basis, improved information at the point of sale. Although there are existing European labelling requirements on energy use, these are reported in kWh per year, rather than running costs for the life of the product. Consumers in many purchasing situations focus on the initial cost instead of the **lifetime running costs**. A recent Norwegian experiment demonstrated that providing information about lifetime electricity running costs at the point of sale led consumers to purchase more energy-efficient tumble dryers[60].

4.6. **DECC is working with the John Lewis Partnership to replicate a similar behavioural trial in the UK.** This trial will give further evidence as to whether providing information on lifetime electricity running costs does help consumers choose more energy-efficient household appliances. The trial will run during 2013, with findings feeding into future policy making (further information is provided in the Energy Efficiency Strategy[61]).

4.7. We are keen to understand whether such information would also be valuable in the non-domestic sector.

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[59] Life cycle costs can be defined as the total cost (in this case both monetary value and carbon impact) of the product over the product's life. It includes the purchase price, installation cost, operating costs, maintenance and upgrade costs, remaining value at the end of its useful life (salvage) and final disposal cost.

[60] http://www.greenudge.no/en/studier/artikkel-under-studier/

[61] http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx

Consultation Question	
14.	**For businesses, what would be a useful form of information on the efficiency of the products and equipment you purchase, recognising how decisions are taken in your organisation? Would your organisation find it useful for running cost information to be included in product information? Please provide an explanation.**

Case Study: US: Energy Star Voluntary Standards and Labelling Programme

Energy Star is a joint programme of the U.S. Environmental Protection Agency and the U.S. Department of Energy to promote energy/electricity-efficient products and practices in the commercial, industrial and residential sectors. Central to the programme is the voluntary labelling of products by manufacturers to show that these are certified as energy-efficient under the Energy Star programme.

In the non-domestic sector, the programme promotes the use of Energy Star-qualified products and practices through partnerships with:

- Manufacturers – advice on certification under the Energy Star programme to be labelled with the Energy Star mark;
- Retailers – encouraging them to supply only Energy Star-qualified products; and
- Businesses – advising them on how they can make energy savings through the products they use, including an on-line tool to quantify the energy costs of different products. Advice is also provided on how businesses can work with their suppliers and use procurement contracts to ensure that they use Energy Star-qualified products where possible.

The Energy Star label is now recognised by over 80% of the American public and there are now over 20,000 private and public sector organisations in partnership with Energy Star. It was officially estimated that energy and cost savings to businesses, organisations and consumers through the Energy Star programme were $18 billion in 2010. The U.S. Government has entered into agreements with other countries, including the EU, Japan, Australia and Canada, to promote specific Energy Star-qualified products in their markets: the agreement with the European Union, for example, is to implement the Energy Star programme for IT office equipment.

Improving information on building and process efficiency

4.8. The new EU Energy Efficiency Directive, agreed in June 2012, contains provisions to help businesses access more relevant and bespoke information on the efficiency of their buildings and industrial processes. Article 8 of the Directive requires large companies to carry out energy audits of buildings, industrial operations and installations every four years: this requirement will need to be implemented by June 2014 The options for implementing for this will be considered within the context of ensuring compliance with the Directive, minimising the administrative burdens on business while ensuring coherence with existing audit-type requirements.

4.9. Small and Medium sized Enterprises (SMEs) will also be encouraged to carry out audits. The Energy Efficiency Strategy contains information on the implementation of the Directive, and DECC will launch a consultation on implementing Article 8 in the first half of 2013.

4.10. It is important that information on energy efficiency opportunities reaches the people within organisations that are most responsible for making decisions. For larger premises, we recognise the important role that Facilities Managers play in managing energy use. The Energy Efficiency Strategy lays out proposals for how Government can support the effective training of Facilities Managers, to ensure that the right people in businesses have the information to maximise the efficiency opportunities.

4.11. The Energy Efficiency Strategy also lays out proposals for a Knowledge Hub, being developed in collaboration with the construction industry. This seeks to develop a fully trusted source of information for the construction industry specifically around refurbishment of existing properties.

4.12. Given the forthcoming implementation of Article 8 of the Energy Efficiency Directive, and the other initiatives being considered as part of the Energy Efficiency Strategy, we judge there is a limited rationale for additional policies to provide information on building efficiency opportunities to businesses.

Information in the Industrial Sector

4.13. As in Chapter 2, the challenges, barriers and efficiency opportunities of the industrial sector are slightly different from the rest of the 'non-domestic sector'. The Government is interested in stakeholder views on what more it might do to drive further efficiency in the use of electricity by overcoming the identified barriers.

4.14. The Energy Efficiency Hub described above is intended to focus on providing information for building projects. We are keen to understand whether businesses undertaking industrial processes feel that more needs to be done to address knowledge gaps which may prevent them taking up efficiency opportunities related to their processes. The Government could help by setting up a dedicated **Industrial Processes Information Hub**, potentially in partnership with a trade association.

4.15. An Industrial Processes Information Hub would be a web-based resource acting as a single point of information for the industry. Depending on the nature of the information gap, such a Hub could add value by pulling together the best available expertise in industrial energy efficiency, including the most recent research on improving the efficiency of individual industrial processes, energy efficiency solutions and tools, best practice training material for equipment designers, specifiers, suppliers and installers, and advice and resources on how to access capital. Such a hub could, if appropriate, also bring together information from other relevant policies so that businesses can identify the most cost-effective opportunities to implement changes across the business.

International Case Study: Australia – Energy Efficiency Exchange information portal

The Energy Efficiency Exchange (EEX) website (eex.gov.au) is a joint initiative of Commonwealth, State and Territory Governments. It supports the implementation of energy efficiency practices within medium and high energy-using companies through providing best practice information on energy efficiency, case studies and resource materials from Australia and overseas. The website was developed to provide a single source of energy efficiency information for industry from a reputable source.

The site provides medium and large energy using companies with access to a consolidated source of national and international resources on energy efficiency. It has been developed for energy and corporate managers, engineers, financial and site staff across a range of sectors supporting the development and implementation of energy management and energy efficiency strategies by companies. It features case studies, energy saving opportunities in key sectors and technologies, information on business support programs, financing options and business case guidance to help companies integrate energy efficiency into all areas of their business.

The EEX website was originally developed in 2007 and was re-launched in March 2012 based on user-centred research to better meet the information needs of users.

Consultation Question	
15.	**Is there interest in a dedicated information source on industrial electricity efficiency opportunities?**
Consultation Question	
16.	**What available sources of information could the Hub include that are not covered elsewhere? How could this information be sourced and validated?**
Consultation Question	
17.	Are there any other better ways of raising awareness in the industrial sector that the Government should consider? Please provide relevant evidence.

4.16. Another way to improve the availability of information on industrial processes, could be the implementation of disaggregated metering (sub-metering).

4.17. Where the electricity consumed by many different processes, or areas of a building, is aggregated through a single meter, businesses cannot see the relative efficiency of different elements of their operation. Disaggregated metering (where smaller meters are used to measure the energy consumed by individual processes, sites or buildings) could help business overcome this information barriers. The Government would be keen to understand whether,

in that case, more needs to be done to encourage organisations to install or make better use of sub-meters.

4.18. The Audits required under the EU Energy Efficiency Directive may fulfil a similar role to sub metering in providing accurate information on the energy efficiency of individual buildings, processes and sites.

Consultation Question	
18.	**If organisations need more specific information about electricity use, can the Government intervene helpfully in this space – for example to encourage a higher take up of sub metering?**

Voluntary schemes to develop electricity efficiency in the non-domestic sector

4.19. In combination, the Ecodesign Framework Directive and EU Labelling Framework Directive have been effective at removing some of the least efficient products from the market in the UK, and providing a basis to compare the relative efficiency of the remaining products.

4.20. There have been some examples of retailers voluntarily going further on efficiency than is required by EU legislation in the past; for example, many retailers voluntarily phased out incandescent bulbs in advance of the EU phase out, which began in 2009.

4.21. We are keen to explore additional voluntary initiatives that could encourage non-domestic consumers to purchase appliances and electronics at the most efficient end of the remaining product range.

A Buyer's Commitment

4.22. For businesses purchasing significant numbers of appliances and electronics, we judge that a voluntary 'Buyer's Commitment' could help to encourage take up of the most efficient choices.

4.23. Many businesses are already aware of the benefits of prioritising action in this area and are pushing to improve their efficiency. One option to support this effort, galvanise additional action and engage company boards would be to create a 'Buyer's Commitment' that recognises and celebrates organisations that commit to only buy appliances or electronics with a high level of efficiency.

4.24. Organisations may fail to buy the most efficient electrical products and appliances because the person paying the upfront cost of the product is not responsible for the running costs (split incentives within the organisation). By making a commitment at a board level, the Buyer's Commitment could help overcome these issues of split incentives and "not front of mind", by helping electrical efficiency become a key factor in purchasing decisions made throughout an organisation.

4.25. An organisation might qualify if (for example) they purchase only:

- ICT that carries the EU Energy Star or products with an EST recommended label; or
- products or appliances that are rated B or above on their EU Energy label if they have one; or
- products or appliances that meet the Ecodesign 'benchmark' standard.

4.26. Such a scheme would be devised in association with partners throughout the sector to maximise uptake. Key considerations include what kind of recognition would be of interest to participants and how to set an ambitious, but achievable level of efficiency. One opportunity would be to provide a recognised accreditation, which organisations could use publically to promote their business. By enhancing businesses reputations, this measure may help energy efficiency gain Board level interest.

4.27. The Government recognises that it may not be best placed to judge what would be a valuable driver in encouraging commercial buyers to voluntarily commit to such a scheme. As such, we are particularly interested in stakeholder views as to the most appropriate approach to any such scheme and what may make it attractive to them.

International Case Study: US GreenChill Program

The GreenChill Advanced Refrigeration Partnership is a cooperative alliance sponsored by the US Environment Protection Agency with the supermarket industry and other stakeholders to promote the adoption of technologies, strategies, and practices that improve refrigeration system energy efficiency and reduce emissions of ozone-depleting substances and greenhouse gases.

In addition to reducing electricity consumption, the recommended approaches also reduce maintenance and refrigerant costs and extend the shelf life of perishable food products. There are three main programmes to help food retailers reduce their electricity consumption and refrigerant emissions: 1) the Food Retailer Corporate Emissions Reduction Program, 2) the Store Certification Program for Advanced Refrigeration, and 3) the Advanced Refrigeration Promotion Program.

According to a progress report published by the US Environmental Protection Agency in 2011, GreenChill had a total of 54 partners with a total of 7,693 stores (around 20% of US supermarkets). In 2011 the scheme prevented the emission of about 6.21 million metric tons of carbon dioxide equivalent. The report estimates that if all supermarkets in the US reduced the amount of refrigerant they leak to the current GreenChill partner average, they could generate annual cost savings of over $100 million across the industry.

Consultation Question	
19.	**Would a Buyer's Commitment to purchase high-efficiency products be of interest to your business? What aspects make this approach appealing?**

Consultation Question	
20.	**What kind of recognition would be valuable to your organisation if considering engaging in a Buyer's Commitment? Would a recognised accreditation that you could display externally increase your interest in participating in a Buyer's Commitment?**

Driving efficiency through the provision of loans

Access to finance to support efficiency in non-domestic buildings

4.28. Two new Government initiatives aim to support businesses struggling to access finance to invest in building efficiency measures:

i. In August 2012, and as a precursor to the **Green Investment Bank**, this Government announced a £100 million fund for non-domestic energy efficiency projects. Overseen by the UK Green Investments (UKGI) team based in the Department for Business, Innovation and Skills (BIS), two fund managers Equitix and SDLC will actively encourage foreign and domestic investment in such projects. The Energy Efficiency Strategy lays out the investment priorities that those funds will focus on.

ii. **The Green Deal** aims to ensure businesses can access financing with some, or all, of the upfront cost removed, to fund efficiency opportunities. There are 45 eligible measures across heating, glazing, lighting, insulation and Microgeneration. To help negotiate the tenant-landlord split incentives, loans will remain with a meter, rather than an individual tenant, and landlords will be unable to refuse reasonable requests from tenants. The Green Investment Bank will also consider investment in the Green Deal market to support building related energy efficiency measures.

4.29. Some commercial businesses may also be able to enter into partnerships with private Energy Service Companies to undertake efficiency measures, which may include the installation of efficiency measures at no upfront cost.

4.30. The combination of the Green Deal and UK Green Investments is likely to provide significant additional support for businesses struggling to access capital. Additional Government action would not add significant value in addition to these schemes.

Access to finance to support efficiency in industrial processes

4.31. There are a number of schemes to help industrial businesses access capital, including the Carbon Trust's £550m Energy Efficiency Financing Scheme which finances projects from £1,000 upward. The Green Investment Bank is also expected to play a role in funding projects in the industrial sector.

4.32. Given existing support, there are no obvious gaps warranting new policy, such as a loan scheme for industrial efficiency projects.

Driving electricity demand reduction through minimum efficiency standards

Efficiency standards for buildings

4.33. Electricity savings could be achieved through regulations which set minimum standards on building energy performance in privately rented buildings. This would be an effective way to overcome the barriers of split incentives between landlords and tenants. This split incentive may be one reason why the private rented sector has the largest proportion of least energy-efficient properties compared to other parts of the housing sector.

4.34. The Energy Act 2011 contains the provisions to introduce a minimum energy efficiency standard on privately rented properties (likely to be set at EPC band 'E') for the residential and non-residential sectors from 2018.[62]

4.35. The Government has committed to working with the sector in advance of any regulations, to encourage uptake of energy efficiency measures through the Green Deal and confirms that any use of these regulation-making powers is conditional on there being no net or upfront costs to landlords.

4.36. We will turn our attention towards the secondary legislation following the establishment of the Green Deal Framework later this year. The Government will work with the sector to develop the details of the policy in advance of a full public consultation.

Consultation Question	
21.	**To what extent do you think efficiency standards in buildings will deliver permanent reductions in electricity demand when implemented?**
Consultation Question	
22.	**Do you have relevant evidence on the effectiveness of standards in driving electricity demand reduction?**

[62] http://www.decc.gov.uk/en/content/cms/tackling/green_deal/gd_industry/private_rented/private_rented.aspx

Case Study: International comparison: Australia Green Lease Scheme: addressing landlord/tenant split incentives

One example of an approach to addressing landlord/tenant split incentives is the Green Lease Scheme (GLS) in Australia. The GLS is a formal commitment to meet minimum building energy performance standards through mutual obligations on tenants and owners of office buildings to achieve efficiency targets.

Every time a new Australian Government office building lease is signed (with some exceptions) a Green Lease Schedule should be included as part of the lease agreement. The Green Lease Schedules are based on the underlying principle that each party performs its obligations under the Green Lease Schedules at its own cost and each party enjoys the savings and benefits. Energy costs are often shared between the landlord and tenant to ensure there is an incentive for both parties to work together to reduce energy costs. For example the leases impose obligations on both the landlord and tenant to achieve and maintain a 4.5 star target under the National Australian Built Environment Rating System. The agreements incorporate separate metering of both the base building and tenancy to allow performance to be monitored effectively and both parties sign up to an energy management plan that is overseen by a building management committee.

While there are no assessments of the overall impact of the scheme case studies suggest it has led to significant improvements in efficiency. For example, the incorporation of a green lease at a building leased by Department of Education, Employment and Workplace Relations in Canberra resulted in an average energy consumption of 1.11 MWh per person per annum (well below the target of 2.083 MWh). Operational costs per square metre of the building were AUS$10.00 cheaper than comparable energy-efficient office buildings in the Canberra area[1].

The Australian State and Territory Governments also promote the use of Green Leases in the private commercial building sector as part of the National Strategy on Energy Efficiency. The Tenant's Guide to Green Leases and the Green Lease Handbook were developed to encourage the uptake of Green Leases in private leasing arrangements. No information is available on the uptake of the scheme.

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[1]Australian Government, Department of Climate Change and Energy Efficiency, Green Lease Schedule Case Study, October 2011: Department of Education, Employment and Workplace Relations (DEEWR) National Office, 50 Marcus Clark Street, Canberra

Efficiency standards for industrial processes

4.37. We have also considered whether minimum efficiency standards for industrial processes would reduce electricity demand effectively. Barriers preventing the full uptake of cost-effective efficiency opportunities in industry include risk aversion and uncertainty, “not front of mind" and lack of awareness. Government recognises that the introduction of minimum efficiency standards

for industrial processes would likely be effective at overcoming these barriers. Depending on the level at which standards are set they could very effectively drive increased levels of electricity efficiency in industries with significant electricity use.

4.38. Industrial processes are unique and specialised. Unlike buildings, where standardised assessment tools (including those used for the EPC assessment) allow easy comparison between properties, comparing a wide range of industrial processes is likely to be very challenging. In the absence of standards to benchmark against, we judge it would be very difficult to develop effective minimum efficiency standards for industrial processes.

4.39. The Government is also committed to ensuring that manufacturing is able to remain competitive during the shift to a low carbon economy, and to minimising the 'carbon leakage' which might happen if investment relocated abroad. Government is therefore in the process of simplifying the policy landscape and removing overlaps[63]. We are keen to avoid any additional requirements on these business which add further costs and may affect their competitiveness in the UK and internationally.

4.40. For these reasons, we do not propose additional efficiency standards for industrial processes at this time.

Consultation Question	
23.	**Do you agree with the Government's assessment against minimum efficiency standards for industrial processes? If not, please provide evidence of how mandatory minimum standards for industry could be set and why, and the impact they could have.**
24.	**Should Government consider any other policy options aimed at overcoming the barriers that prevent the full take up of efficiency opportunities in:** • **Domestic or non-domestic buildings** • **Domestic or non-domestic product choices** • **Industrial processes?**

[63] As announced in the Autumn Statement 2001, http://cdn.hm-treasury.gov.uk/autumn_statement.pdf

5. Measurement, Verification (M&V) and Additionality

The need for Measurement and Verification (M&V) and Additionality standards in the context of a financial mechanisms

5.1. In shaping the design of any financial instrument (as set out in Chapter 3) a key concern is to ensure that electricity savings are real, sustained and additional. Standards of Measurement and Verification (M&V) and Additionality exist to ensure these goals are met. Ensuring that these standards are incorporated into the design of an instrument will reduce the risk that a financial incentive could provide significant streams of money to projects that are ineffective, already planned, or at worst fraudulent.

5.2. **Measurement and Verification (M&V)** is concerned with establishing that projects deliver real, and measurable electricity savings. M&V methods are used to establish the amount of electricity (in KWh) that has been saved through an individual efficiency project. If a new financial incentive scheme were established, centralised standards of M&V would help to ensure that the projects delivering the greatest real electricity savings could be prioritised, and that confidence could be taken in the total electricity savings that the financial incentive scheme has produced.

5.3. Failing to deliver high standards of M&V for a scheme would risk:

- Developers claiming financial support for fraudulent projects that don't actually exist;
- Developers being rewarded for efficiency measures that result in very low or uncertain electricity savings; and
- Being unable to accurately measure the total (MWh) electricity savings produced by an efficiency scheme.

These would deliver poor overall value for money for the level of financial incentive provided.

5.4. **Additionality** is concerned with identifying those efficiency projects that would have happened even without policy intervention (because they make financial sense for individuals or businesses, or are incentivised by existing policies), and those which are truly brought forward by the policy. Where a scheme offers support to projects that would have happened absent the scheme this is known as 'deadweight'. The risk of non-additionality is relevant to all of the policies discussed in this document and minimising deadweight is key to developing a policy intervention which can offer value for money.

5.5. Failing to set high standards of additionality for a scheme would risk:

i. Individuals or businesses claiming a financial incentive for a measure they were intending to do without financial support – for example, replacing equipment with more efficient versions or installing building efficiency measures.

ii. Developers claiming financial support for projects that were already incentivised by policy or required by law (for example, to meet minimum regulatory standards).

5.6. Given that many electricity efficiency measures are cost effective and result in overall savings for individuals and businesses, determining the level of additionality offered by a scheme is challenging. Additionality is affected by a number of factors including the difference in cost between standard and efficient equipment; the extent to which the more efficient option is already commonplace; the duration of the replacement cycle and the impact of pre-existing policy. Additionality is central in determining if a policy delivers value for money and in comparing value for money between options.

5.7. Consideration of additionality allows:

i. For policy design to target those measures, sectors and mechanisms most likely to result in high additional electricity saving; and
ii. Standards and tests to be defined, to be used in the context of a financial incentive mechanism, to distinguish between those policies which are and are not eligible for support.

Case study: M&V and Additionality in practice

In 2010, the UK Government decided that Energy Companies could no longer promote compact fluorescent light bulbs (CFLs) to meet their obligations under the Carbon Emissions Reduction Target (CERT) policy[1].

One of the reasons for doing so was because of **M&V difficulties**. The energy (and carbon) savings resulting from installing CFL bulbs had been estimated based on tests of the lifetime energy consumed by CFL bulbs and the incandescent bulbs they typically replace. However, since there was no guarantee of how customers would use the CFLs provided to them, it was difficult to know whether these estimated energy savings were actually being delivered in practice – the CFLs might have been installed and used, or installed and quickly replaced by a less efficient alternative, or merely kept in a cupboard.

A second concern was the **additionality** of promoting CFLs. From 2009, EU Legislation began to require retailers to phase out the sale of the incandescent light bulbs that CFL bulbs typically replace. Those responding to the Government consultation expressed concern that most households would therefore move from incandescent bulbs to CFLs even without help from Energy Companies – and therefore that the support provided by Energy Companies should not be considered to provide additional energy savings.

Removing CFLs from the scheme was therefore a way of ensuring that the scheme prioritised those measures that would result in the highest real energy savings (M&V), and drive savings beyond existing policy (additionality).

1 http://www.decc.gov.uk/assets/decc/consultations/certextension/certextgovresponse.pdf

International comparators

5.8. To identify what centralised standards of M&V and additionality may be appropriate for a possible UK financial incentive, we commissioned technical consultancy on the requirements for M&V and additionality standards. The work included an international review of M&V and additionality approaches used by financial incentive schemes in other countries. This analysis is published alongside the consultation[64].

5.9. The analysis considered:

- The requirements for a robust M&V and additionality approach in the context of a financial incentive scheme for efficiency measures;
- Benefits and risks of different definitions of additionality;
- Risks of failure to address M&V and additionality;
- Key challenges for identifying approaches to M&V and additionality in the context of a paid-for efficiency scheme;
- Lessons from international comparators; and
- The relevance of the International Performance Measurement and Verification Protocol (IPMVP).

M&V in the context of a UK financial incentive scheme

5.10. If a financial incentive scheme were available in the UK, we anticipate that standards of M&V would be set centrally. These standards would lay out the requirements on project developers to prove the electricity savings (in kWh) for which support can be claimed.

5.11. The international review has highlighted a number of potential approaches that could be used to define such central standards.

International lessons on M&V and relevance to the UK

5.12. The international review highlighted two main approaches to measuring and verifying the energy or emissions savings that result from efficiency projects: those where the savings are estimated before a measure is installed (so-called *ex-ante* or deemed savings approaches) and those where the savings are measured in each individual installation (so-called *ex-post* methods). Hybrid methods combining elements of the two approaches have also been used.

5.13. In *ex ante* M&V schemes, the amount of energy saved by an efficiency intervention is estimated in advance of installation. The estimated savings are calculated through laboratory measurements and on site testing. The scheme administrator (either Government, or a contracted body) will typically produce these values and update them through time. Project developers wishing to claim support for an efficiency measure can use these pre-defined lists of energy savings to determine the level of savings they are eligible to claim they have achieved.

[64] Lovinfosse et al, *Measurement, Verification and Additionality of Electricity Demand Reductions*, ECOFYS, 2012

5.14. In *ex-post* M&V schemes, the amount of energy saved by an efficiency project is measured in each individual installation. The energy consumption of a property, work area or industrial process is measured before and after installing an efficiency intervention. Some of the measured energy changes may not be attributable to the specific efficiency project (for example, if they are simply due to a change in weather, building occupancy, or the amount of work being carried out). To establish what proportion of the energy change can be attributed to the installed measure, an extended baseline is developed, to establish what energy consumption "would have been", without the efficiency intervention – this is typically the energy use before the efficiency measure was installed, adjusted for weather, building occupancy and other factors such as output of industrial processes. The difference between this extended baseline and measured energy use can then be attributed to the efficiency intervention.

5.15. Hybrid approaches, where the energy savings are calculated from a combination of pre-defined values, and some which are measured on site, have also been used. These measures are used when the energy saving impact of an efficiency project is well understood but may vary depending on a limited number of identifiable parameters. For each project type a specific evaluation algorithm is defined, with pre-defined values for some parameters while other parameters have to be measured in each individual installation.

Case study: M&V approaches used in the Italian Energy Efficiency Obligation

In Italy, the *Titoli di Efficienza Energetica* (TEE) energy efficiency obligation requires suppliers to meet energy efficiency targets by purchasing tradable "White Certificates" in certified energy demand reduction. Three different M&V approaches are used within the scheme.

- A "deemed savings" approach is used to determine the level of energy savings attributable to some measures, including replacement of lightbulbs. In this approach, the programme administrator provides data sheets of standardised evaluations in which the amount of energy saved is defined for each installed unit. The deemed savings are calculated by multiplying the difference in energy consumption of the two lighting alternatives by the estimated average hours of use during the lifetime of the measure.
- For larger commercial or industrial projects, an energy monitoring plan is required. Measurements of energy consumption before and after implementation are required, to determine the level of energy saving that can be attributed to the efficiency measure.
- A hybrid "engineering" approach is used for projects such as implementing variable speed drives in industrial pumps. The energy saving impact of the efficiency measure is well understood but varies depending on a limited number of identifiable parameters (e.g. capacity factor), which can be measured, and then inputted into a pre-prepared algorithm to determine the actual energy saved.

5.16. The international review highlights that most national-level efficiency schemes allow some efficiency projects to use *ex-ante* M&V approaches[65]. The main advantage of an *ex-ante* approach is a reduced administrative burden on individual project developers, who need not measure the efficiency savings resulting from each individual intervention. Before installing a measure developers know the energy savings it will have been considered to achieve (and therefore, in many cases, they are certain of the financial support they are eligible to claim). This may increase the take up of a financial incentive. In contrast, with ex-post measurement the verified electricity savings are not known until after the efficiency project is installed. So project developers must make an efficiency investment before the final attributable savings are known. This uncertainty about the level of financial support to which they will be eligible, lessens the impetus to do so.

5.17. However due to the individual nature of the efficiency projects, assumed measurements may be less accurate[66] than ex-post, which would correctly reward greater than normal improvement.

5.18. There is significant international experience in measuring the efficiency savings of projects through on-site measurement and project-specific baselines. Interviews with Energy Service Companies who implement energy-saving projects for large commercial and public sector customers highlighted that these companies are often required to demonstrate energy savings before being able to share the resulting financial savings with clients. Project-specific baselines are commonly used in these cases, and the International Performance Measurement and Verification Protocol (IPMVP) is an international protocol which establishes standardised procedures to allow these baselines to be established.

Conclusions and questions on M&V for a UK financial incentive

5.19. The international review suggests that the most common precedent for a UK-wide financial incentive would be to define a centralised standard of M&V which, depending on the measures and sectors in scope, may allow projects to be rewarded via *ex-ante*, *ex-post* or hybrid approaches to M&V.

Consultation Question	
25.	**What further evidence exists on the accuracy of these approaches to M&V, and how this varies by types of efficiency intervention? What may be the basis for distinguishing which approaches are most relevant for which efficiency projects?**

[65] This was the dominant M&V approach used in French and Italian Energy Efficiency Obligations.
[66] This is required in Italian, French and Danish schemes.

Additionality in the context of a possible UK financial incentive scheme

5.20. In the context of a UK financial incentive scheme, understanding additionality is important:

a. To allow the policy design to target those measures, sectors and mechanisms that are most likely to result in high additional electricity savings; and

b. In the event that a financial incentive scheme were implemented, to allow standards and tests to be developed, which could be used to distinguish between those projects most deserving of financial support (most additional).

5.21. Additionality is unlikely to be a clear-cut issue: there may be differing degrees of additionality. For example, where a business invests in an energy-efficient lighting scheme two years earlier than it would otherwise have done as a result of a policy scheme, there will be additional electricity savings for two years as a result of the policy. The remaining savings achieved by the lighting system would have been achieved anyway under "business as usual" and so cannot be viewed as being generated by the policy.

5.22. We judge that the level of additional demand reduction that an efficiency scheme realises may vary, depending on a number of factors:

i. The barriers that would have prevented it occuring without policy intervention;

ii. The policies that already apply to it (for example, EU Ecodesign Framework Directive, which bans a number of products from sale);

iii. The cost associated with the measure – whether replacing equipment, or upgrading to a more efficient version at the point of sale;

iv. The difference in cost between the standard option and the energy-efficient alternative;

v. The natural replacement cycle;

vi. The payback period that is acceptable to the sector and industry involved; and

vii. The current level of market penetration of the specific technology.

International lessons on Additionality and relevance to the UK

5.23. The international review highlights that approaches to setting centralised standards of additionality are less standardised than approaches to M&V. This may be because additionality is affected by a wide range of factors and is more context-specific. Unlike M&V, where an international protocol (IPMVP) helps to define good practice, there is no widely-agreed set of procedures for assessing additionality.

5.24. The international review highlighted that financial tests had been used to attempt to determine additionality of efficiency projects[67] – but that given the

[67] For example, this is one route of proving additionality accepted by the UNFCCC Clean Development Mechanism

high proportion of efficiency projects that are cost effective, other non-financial tests had been used also.

5.25. In addition to financial feasibility tests, the following tests or questions have been used internationally, to determine whether efficiency projects are providing additional impact:

i. **Would the project be prevented by other (non financial) barriers, even if it is financially feasible?** This barrier analysis technique is used in the UNFCCC Clean Development Mechanism.

ii. **Is the project already standard practice? Is market penetration already significant?** The Italian Energy Efficiency Obligation scheme uses an analysis of market penetration to determine an "additionality coefficient" for different technologies – those with the highest market penetration are eligible for the least support, as they are considered to be least likely to be additional.

iii. **When similar projects were implemented in the past, was there evidence of significant numbers of "free riders"?** Some participants in the US National Action Plan for Energy Efficiency used surveys of past participants to determine what proportion of projects supported would not have happened without policy intervention (expressed as "net to gross ratios").

Case study: Financial and non-financial tests of additionality in the UNFCCC Clean Development Mechanism (CDM)

The United Nations Framework Convention on Climate Change Clean Development Mechanism allows countries to claim Certified Emission Reduction (CER) credits by implementing greenhouse-gas reducing projects in developing countries, and use these credits towards meeting internationally-agreed emissions reduction targets. The UNFCCC considers a CDM project additional if "anthropogenic emissions of greenhouse gases … are reduced below those that would have occurred in the absence of the registered CDM project activity". A methodological tool has been developed to assess the additionality of projects.

This framework allows two main routes of demonstrating additionality – one, if a project developer can prove that a project is unlikely to be financially attractive without the support, and a second route if a project is known to be financially attractive without the support, but prevented by other barriers. The framework also requires developers to prove that the project is not already "common practice".

An independent evaluation of the effectiveness of this framework highlighted that 50-95% of projects deemed additional by this framework were, on further analysis, confirmed to be "unquestionably additional". Of relevance to efficiency projects, however, was the finding that the framework was most accurate in demonstrating additionality in cases where CDM support influenced the financial attractiveness of a project. In projects where the CDM support was not the main source of revenue, the additionality framework was less likely to be accurate.

Ex ante and case-by-case approaches to additionality

5.26. In Italian, Norwegian and French efficiency obligations, an up-front analysis of additionality was used to determine a list of efficiency measures eligible for support. This is an *ex-ante* approach to additionality, which shares many of the advantages of an *ex-ante* approach to M&V, which is that project developers receive certainty before undertaking a measure on the level of additionality that their measure will be eligible to claim.

5.27. The benefit of this approach would be to allow project developers to have certainty before making an investment that their scheme is eligible for inclusion. However, the additionality of an individual project (for example, installing high-efficiency lighting) may vary between buildings and sectors, and a centralised approach to additionality may struggle to distinguish these nuanced considerations. This could result in projects receiving support in sectors where they are not truly additional, or projects being excluded from support in specific cases where they would have been demonstrably additional.

5.28. An altenative approach would be to take a project-by-project or programme-by-programme approach to additionality, where tests of additionality would be considered individually for each efficiency intervention[68]. This would provide greater accuracy around the additionality of individual projects, but is likely to involve significant adminstrative burden for project developers.

Targeting support at efficiency projects with greatest additionality: the use of additionality coefficients

5.29. The international review highlights that some efficiency projects are more likely to be additional than others. A review of measures undertaken through the US National Action Plan on Energy Efficiency found that additionality varied considerably by measure. There was no clear pattern, but whole home/retrofit projects tended to prove highly additional in this analysis, whereas the proportion of free riders (those who receive support for a measure they were intending to take) was high for some commercial HVAC and refrigeration projects.

5.30. The international review also highlighted that while some schemes took a binary approach to additionality (schemes were either additional, and included, or non-additional, and excluded)[69], others took a graded approach - notably the Italian White Certificate scheme. This scheme allowed for support to be provided to efficiency measures that were not entirely additional – but the level of support provided was adjusted accordingly.

[68] This approach has been used in the Clean Development Mechanism
[69] For example in the Clean Development Mechanism

Conclusions and questions on Additionality for a UK financial incentive

5.31. Chapter 3 of this consultation seeks views on the applicability of a UK financial incentive in a number of different sectors – including buildings (non-domestic and domestic), industrial projects and products-related efficiency measures.

5.32. Additionality considerations may vary significantly between these sectors. Further work will need to consider the range of factors set out at paragraph 5.25 in the context of the range of different electricity efficiency projects which are available: how do the additonality issues vary by measure (e.g. lighting controls) and by sector (e.g. non-domestic buildings)? These considerations would need to be taken into account in designing any financial instrument.

Consultation Question	
26.	**For which electricity demand reduction measures and technologies do you believe new policy would most likely be additional? What evidence is available on this?**
Consultation Question	
27.	**Specifically, what evidence is available on the likely additionality of measures in industrial processes and non-domestic buildings?**

5.33. As in other European schemes, in the context of a UK financial incentive, analysis of the additionality of different measures could be used to place *ex-ante* restrictions on which projects are eligible for support. This would allow an "approved list" of measures to be produced, potentially including additionality coefficients describing the level of support available.

5.34. Alternatively, it may be decided that the additionality of a project must be determined on a case-by-case basis.

5.35. Whether a project-by-project or *ex-ante* approach were taken, we envisage that a number of tests would be required to determine which projects are most additional.

Consultation Question	
28.	**In the context of a financial incentive scheme, would the flexibility and accuracy of taking a case-by-case approach to additionality justify the administrative burden that this would require? What evidence is available on this?**
Consultation Question	
29.	**What, if any, is a practical approach to identifying the additionality of projects ex-ante (including measures such as those identified above)? Which types of measures and sectors are suitable for financial incentives and how should the acceptable projects be identified?**

5.36. Subject to being able to define appropriate levels of additionality, an approach of using "additionality coefficients" may be suitable to use in the context of a UK financial mechanism.

5.37. This approach would see the level of financial support provided to projects weighted towards their additionality. For example, a project which delivered 1 MWh saving, but was expected to be 40% additional, would receive half the level of financial support as a project that delivered 1 MWh electricity saving but was judged to be 80% additional. One risk of this, however, would be that offering lower levels of support (to adjust for additionality) may then discourage projects that were not fully additional but still worthwhile from coming forward.

Consultation Question	
30.	**Could coefficients be used to reward projects which are *partly* additional? How should such coefficients be calculated? If so, what are the best practice examples of this approach we should consider further?**

6. Summary by sectors

Domestic buildings

6.1. Our analysis highlights that existing policies focus heavily on the domestic sector, where coverage of existing policies is greatest. A range of policies is in place to encourage the efficient use of electricity in domestic buildings, including the Green Deal and ECO, the roll out of smart meters and current building regulations.

6.2. These policies are targeted at the key information and behavioural barriers indentified in the sector. Further policy interventions to encourage domestic building fabric efficiency measures (such as insulating electrically-heated homes) are unlikely to have a significant impact on electricity demand. Further policy may complicate the delivery of existing policies.

6.3. Our analysis suggests that there remains some scope to deliver real reductions in electricity consumption in homes by incentivising behaviour-change measures. Evidence from the US suggests that innovative uses of real-time energy consumption data combined with targeted recommendations can encourage households to reduce their electricity consumption. We would expect these savings to be additional to the electricity savings resulting from building fabric measures in scope of the Green Deal and ECO, and the behaviour changes resulting from smart meters.

6.4. We seek views on whether this type of policy would be effective delivering verifiable reductions in electricity demand.

Non-domestic buildings

6.5. Our analysis highlights significant potential to drive more electricity savings in non-domestic buildings through measures such as high-efficiency lighting, lighting controls and HVAC controls.

6.6. While existing policies have had reasonably limited impact in this sector, some of the potential savings that our analysis has identified are likely to be driven by new policies which will take effect in the coming years. Under the EU Energy Efficiency Directive, large companies will carry out energy audits of their buildings, industrial operations and installations every four years, beginning by June 2014. This will help businesses uncover additional efficiency opportunities. The non-domestic Green Deal will support businesses in accessing financing to fund efficiency opportunities with some, or all, of the upfront cost removed. UK Green Investments, the precursor to the Green Investment Bank has also announced a £100 million fund for non-domestic energy efficiency projects.

6.7. We have outlined options for additional policy in this sector. In particular, we are keen to hear views on whether a financial incentive would be effective in driving additional electricity demand reduction beyond these upcoming

policies, and particularly in overcoming the issues of “not front of mind” (bounded rationality) and unacceptable payback periods.

6.8. If a financial incentive were undertaken, delivery may be through a targeted scheme or a market-wide incentive. A targeted scheme would provide a specific incentive for measures such as high-efficiency lighting, whereas a market-wide incentive would provide financial support for broader projects, such as “whole property” efficiency interventions.

6.9. We are keen to understand both whether a financial incentive is considered to be effective way of incentivising further electricity savings, and if so, which delivery route would be preferred.

Domestic products

6.10. Much of the electricity used in our homes powers appliances and electronics, and this is a key area to consider the potential for additional savings. EU legislation places minimum efficiency standards on many domestic products, effectively removing the lowest performers from the market and resulting in significant electricity savings. We will continue to press hard to ensure that this is continuously improved and the scope widened in line with evidence.

6.11. Our analysis suggests that these minimum standards will capture much of the remaining potential for electricity demand reduction, by continuing to remove the least efficient products from the market. We do know, however, that key barriers such as bounded rationality and lack of information mean that where a range of products remains, consumers often do not choose the highest energy-efficient product at the point of sale. We propose to continue to explore voluntary ways with retailers to help support buying decisions – including making better information available to consumers.

6.12. We have also considered whether a financial incentive is an appropriate way to drive more efficient buying decisions, if additionality concerns can be addressed sufficiently. We would be particularly interested in respondents’ views on whether financial support for the domestic sector is justified, along with evidence supporting your answer. We are also seeking views on whether there are other non-financial policy options we should consider.

Non-domestic products

6.13. As with domestic products, EU legislation is expected to be effective in removing some of the lowest performing non-domestic products and appliances from the market and we will continue to push the EU to include a wider range of commercial products.

6.14. Our analysis has highlighted that there is still some technical potential for efficiency savings that could be unlocked by tackling key barriers in the sector such as lack of information, split incentives and “not front of mind” (bounded rationality) within the sector, and driving businesses to purchase at the most efficient end of appliances and electronics. We have examined several policy

options which seek to address some of these barriers and invite opinions on these.

6.15. We are particularly keen to hear views on the types of information businesses feel would help them make more efficient purchases, and on whether there would be interest amongst businesses to making a commitment to only purchase high efficiency products.

6.16. Finally we would like to better understand whether a financial incentive would be an effective way to drive businesses towards making efficient product choices, and if so, the best routes for delivering such an incentive.

Industrial processes

6.17. A number of policies encourage electricity efficiency in industrial processes, including Climate Change Agreements and the Enhanced Capital Allowance scheme. These policies go some way to driving electricity efficiency but our analysis suggests there is potential to go further.

6.18. Key barriers to this are risk aversion, uncertainty among businesses that they will capture the benefit of the investment, and payback periods that are too long to justify investment.

6.19. We are therefore keen to hear whether a new financial incentive could be effective in overcoming these barriers. This incentive may be a targeted incentive, focused at specific pieces of equipment, or a market-wide incentive, paid on the basis of electricity savings made. In either case, interactions with the existing policies would need careful consideration.

6.20. We are interested in respondents' evidenced views on whether a financial incentive for industrial processes is justified and the most appropriate policy intervention.

6.21. We are interested in whether a new, trusted single information source, in the form of an online industrial process information hub may would help the uptake of energy efficiency measures to help address knowledge gaps. We are also seeking views on whether Government could or should support take up of disaggregated metering to provide better information on industrial process electricity consumption.

6.22. We are keen to understand if there are other non-financial policy options we should consider.

Summary table of consultation proposals

Sector	Barriers	Key Existing policies	Financial proposals and how they address the barriers	Non-Financial proposals and how they address the barriers
Domestic Buildings	Lack of information "Not front of mind" (bounded rationality) Landlord tenant split incentives Access to capital	Green Deal and ECO Smart Meter Roll Out Renewable Heat Incentive/ Premium Payment	A **market-wide** financial incentive focused on behavioural change. Possibly implemented through an aggregator or ESCO. We consider this might address "not front of mind" by further incentivising people to be aware of their use.	**Notes** the upcoming requirement for all rented properties to meet minimum efficiency standards (conditional on no net or upfront costs on landlords). We consider that this will be an effective way of overcoming split incentives between landlords and tenants.
Non-Domestic Buildings	Landlord tenant split incentives (66% tenancy in this sector) Other split incentives Hurdle rate and payback periods "Not front of mind" (bounded rationality) Lack of information and awareness	CRC Energy Efficiency Scheme Non-Domestic Green Deal Enhanced Capital Allowances	**Targeted financial incentive** for specific interventions (lighting controls, HVAC controls, high efficiency lighting systems). We believe this could overcome reluctance due to hurdle rate and unacceptable payback periods challenges. **A market-wide** financial incentive, applicable to a wide range of electricity efficiency measures. Barriers in this sector are less well-addressed through other mechanisms, so a financial incentive could address payback periods and bounded rationality.	**Notes that** the upcoming Energy Efficiency Directive will involve periodic efficiency audits for businesses. We believe this will build on existing policies (notably the CRC Energy Efficiency Scheme) and help businesses access relevant information about efficiency opportunities. **Notes that** the Green Investment Bank and Non-domestic Green Deal both seek to provide access to finance. Where businesses struggle to access finance for efficiency investments, we consider these initiatives will provide significant support. **Notes the** upcoming requirement for all rented properties to meet minimum efficiency standards (conditional on no net or upfront costs on landlords).

Sector	Barriers	Key Existing policies	Financial proposals and how they address the barriers	Non-Financial proposals and how they address the barriers
				We consider that this will be an effective way of overcoming split incentives between landlords and tenants in the commercial sector, where around two thirds of properties are rented.
Domestic Products	Lack of Information "Not front of mind"/ bounded rationality Split incentives Access to capital	EU Ecodesign Framework Directive EU Labelling Directive	**Targeted** support through a voucher or certificate scheme, which meets strict criteria of additionality. This could specifically address the problem with "not front of mind" (bounded rationality). **A market-wide** financial incentive, applicable to all or some electricity efficient products, potentially through an aggregator or ESCO. This could potentially address the lack of information and focus (bounded rationality) and access to capital barriers identified.	**Restates the UK's commitment to** continued EU negotiations with other Member States for higher standards and labelling across more product. Minimum product standards have been proven to be an effective way of overcoming barriers of "not front of mind" and lack of information. Continuing to drive for ambitious standards remains the primary route to improving the efficiency of products in the UK. **Notes** the trial of a voluntary scheme which seeks to provide additional labelling on running costs at the point of sale.
Non-Domestic Products	Split incentives Lack of information "Not front of mind" (bounded rationality)	EU Ecodesign Framework Directive EU Labelling Directive CRC Energy Efficiency Scheme European Energy Star Programme Enhanced Capital	**Targeted** support; could be same as for domestic products. Again this would address the problem of "not front of mind" (bounded rationality). **A market-wide** financial incentive, applicable to all or some electricity efficient products. This could potentially address split incentives and lack of information and focus (bounded	**Seeks views** on whether additional labelling information would be valuable. We believe that better labelling could overcome barriers around information and "not front of mind" (bounded rationality). Building on the trail of information in the domestic sector, we are seeking views on whether additional voluntary schemes would be valuable in the non-

Sector	Barriers	Key Existing policies	Financial proposals and how they address the barriers	Non-Financial proposals and how they address the barriers
		Allowance Scheme	rationality) barriers identified.	domestic sector. **Seeks views on a Buyer's commitment to purchase high efficiency products** We believe that this could help overcome "not front of mind" (bounded rationality) and some split incentives within businesses. We are seeking views on what may interest businesses in participating. **Notes the UK's commitment to** continued EU negotiations as for domestic products. Particularly, we will continue to negotiate for standards to be put in place for more non-domestic products.
Industrial Processes	Risk aversion and uncertainty Unacceptable hurdle rate/payback "Not front of mind" (bounded rationality) Access to capital Product availability Lack of information	Climate Change Levy and Climate Change Agreements CRC Energy Efficiency Scheme Enhanced Capital Allowances EU Ecodesign Framework Directive	**A targeted** incentive e.g. a scrappage scheme or increase in the use of the ECA scheme, to increase rate at which industrial pumps, motors etc are replaced. This could overcome some of the risk aversion/ uncertainty as well as improving the hurdle rate/ payback period. **A market-wide** financial incentive, applicable to all or some electricity efficiency measures. We believe that this could overcome the barriers presented by unacceptable payback periods, lack of information and focus and	**Notes that** the upcoming Energy Efficiency Directive will involve periodic efficiency audits for businesses, including industrial processes. This builds on existing policies (notably the CRC Energy Efficiency Scheme) and help businesses access relevant information. **Seeks views on an Industrial Processes Information Hub** By bringing together relevant information and expertise in efficiency opportunities, this could provide a trusted source to overcome information barriers. We are seeking views on whether

Sector	Barriers	Key Existing policies	Financial proposals and how they address the barriers	Non-Financial proposals and how they address the barriers
			risk aversion.	business would welcome such a resource. **Seeks views on Government support for greater disaggregated metering** Where businesses do not have accurate information on the relative efficiency of different elements of their operation. disaggregated metering would seek to overcome the information barriers that arise in those situations. We are seeking views on whether this would be of value to industrial businesses, and if so how Government could support. **Proposes not to consider** further mandatory efficiency standards for industrial processes.

Summary of consultation questions

Consultation Question – Chapter 1	
1.	DECC would welcome further evidence and analysis to support and increase our understanding of the potential for cost-effective energy-efficiency measures, the abatement potential and the cost of abatement.
Consultation Question – Chapter 3	
2.	Do you have evidence on whether offering a financial incentive is likely to be an effective way of overcoming the barriers that prevent efficiency measures being taken up in non-domestic buildings, bearing in mind the policy measures that already drive energy efficiency in non-domestic buildings?
3.	Do you have evidence on whether offering a financial incentive is likely to be an effective way of overcoming the barriers that prevent efficiency measures being taken up in industrial processes? Explain your point of view.
4.	Should Government consider a product-specific financial incentive in the domestic sector in spite of the risks and limited potential (23% of domestic product untapped potential as set out in Chapter 2)? If so, how could we design an incentive that would drive better purchasing or usage, rather than early product replacement?
5.	Would a financial incentive be effective in driving efficient product choices in the non-domestic sector? What evidence is there of this and what are the differences, if any, to the case with domestic products?
6.	If a targeted financial incentive for non-domestic buildings were available, which efficiency measures should be a priority for the scheme? What evidence is available to support your view?
7.	Do you consider a targeted financial incentive an effective way of encouraging higher and additional efficiency in industrial processes? Which efficiency measures should be a priority for any scheme? What evidence is available to support your view?
8.	Should Government consider a targeted financial incentive to support the purchasing of higher energy-efficient products? How could the efficiency of such a scheme be maximised?

	Would a voucher or certificate scheme work? If not, what other options should we consider? **Please make clear in your response whether you are referring to the domestic or non-domestic sector or both.**
9.	**What restrictions, if any, should there be on which sectors and measures are eligible to participate in a market-wide scheme? Please explain.**
10.	**What are your views on the comparative merits and disadvantages of targeted financial incentive schemes and market-wide ones? Please explain your response.**
11.	**Should Government consider a market-wide financial incentive to support further electricity efficiency measures? Please explain your response.**
12.	**What are the key elements of a financial incentive scheme to encourage participation? Including but not limited to payment level, length of payback period, who manages the scheme, whether the level of payment is known upfront or determined through the sale of a certificate. Please provide evidence to support your views and reference relevance to the different sectors as appropriate (domestic buildings and products, non-domestic buildings and products and industrial processes).**
13.	**Do you have any other views or evidence on the relevance of a financial mechanism not captured by the questions above?**
Consultation Question – Chapter 4	
14.	**For businesses, what would be a useful form of information on the efficiency of the products and equipment you purchase, recognising how decisions are taken in your organisation? Would your organisation find it useful for running cost information to be included in product information? Please provide an explanation.**
15	**Is there interest in a dedicated information source on industrial electricity efficiency opportunities?**
16.	**What available sources of information could the Hub include that are not covered elsewhere? How could this information be sourced and validated?**
17.	**Are there any other better ways of raising awareness in the industrial sector that the Government should consider? Please provide relevant evidence.**

18.	**If organisations need more specific information about electricity use, can the Government intervene helpfully in this space – for example to encourage a higher take up of sub metering?**
19.	**Would a Buyer's Commitment to purchase high-efficiency products be of interest to your business? What aspects make this approach appealing?**
20.	**What kind of recognition would be valuable to your organisation if considering engaging in a Buyer's Commitment? Would a recognised accreditation that you could display externally increase your interest in participating in a Buyer's Commitment?**
21.	**To what extent do you think efficiency standards in buildings will deliver permanent reductions in electricity demand when implemented?**
22.	**Do you have relevant evidence on the effectiveness of standards in driving electricity demand reduction?**
23.	**Do you agree with the Government's assessment against minimum efficiency standards for industrial processes? If not, please provide evidence of how mandatory minimum standards for industry could be set and why, and the impact they could be expected to have.**
24.	**Should Government consider any other policy options aimed at overcoming the barriers that prevent the full take up of efficiency opportunities in:** • **Domestic or non-domestic buildings** • **Domestic or non-domestic product choices** • **Industrial processes?**
Consultation Question – Chapter 5	
25.	**What further evidence exists on the accuracy of these approaches to M&V, and how this varies by types of efficiency intervention? What may be the basis for distinguishing which approaches are most relevant for which efficiency projects?**
26.	**For which electricity demand reduction measures and technologies do you believe new policy would most likely be additional? What evidence is available on this?**
27.	**Specifically, what evidence is available on the likely additionality of measures in industrial processes and non-domestic buildings?**

28.	**In the context of a financial incentive scheme, would the flexibility and accuracy of taking a case-by-case approach to additionality justify the administrative burden that this would require? What evidence is available on this?**
29.	**What, if any, is a practical approach to identifying the additionality of projects ex-ante (including measures such as those identified above)? Which types of measures and sectors are suitable for financial incentives and how should the acceptable projects be identified?**
30.	**Could coefficients be used to reward projects which are *partly* additional? How should such coefficients be calculated? If so, what are the best practice examples of this approach we should consider further?**

Annex 1: Existing Policy Measures

1. There are a number of policies already in place or planned to encourage electricity efficiency. On a sector by sector basis these are:

Domestic Buildings

2. The **Green Deal** framework will tackle a number of the key barriers to the take-up of energy efficiency measures. Households will start with a property assessment by an authorised assessor which will identify the measures that need to be installed in a property and how much energy they will save. These energy efficiency measures will be provided by businesses people can trust, installed by authorised professionals, and backed up with a legal framework to protect the consumer.

3. Households are then able to pay for some or all of the improvements over time through their electricity bill. Repayments will be no more than a typical household should save in energy costs. The accreditation, assessment and removal of upfront costs are all designed to overcome the key behavioural and information barriers to the take-up of measures. During its initial period the Green Deal will be supported by a Government cash-back scheme to further help build awareness and demand.

4. The **Energy Company Obligation (ECO)** further supports the Green Deal and provides targeted financial support for more expensive measures such as solid wall and hard to treat cavity wall insulation, and for measures installed in low-income households. It is primarily targeted at delivering reduction in carbon emission but it will also lead to reductions in electricity demand as many of these measure will be installed electrically heated homes. The Green Investment Bank will also consider investment in the Green Deal market to support building related energy efficiency measures.

5. An **Energy Performance Certificate (EPC)** is required of all properties at the point of being rented or sold. An EPC provides a summary of the current energy efficiency of a building, the building's potential energy efficiency, and recommends a number of measures that could be installed to improve the current rating. EPCs are targeted at overcoming challenges around lack of information.

6. The mass roll out of **smart meters** is expected to start in 2014 and to be completed in 2019. Smart meters will provide consumers with real time information on their electricity consumption which can help them control and manage their electricity use and save money. They will also provide households with more accurate information and bring an end to estimated billing. This will address one of the main information barriers to electricity efficiency.

7. Government has committed to requiring all homes coming through the planning system from 2016 to meet the **zero carbon standard**. This will require zero net emissions from fixed services - heating, lighting and hot water.

Such 'regulated' emissions are covered by the Building Regulations. Therefore the regulations are expected to drive the majority of electricity demand reduction in new buildings that could be addressed by house builders. Building Regulations also place minimum efficiency standards on the installation of new heating systems.

Non-domestic buildings - Commercial, industrial and public sector buildings

8. **The CRC Energy Efficiency Scheme** (CRC) - a mandatory UK-wide trading scheme introduced in April 2010 which targets emissions from large public and private sector organisations. It is designed to incentivise the uptake of cost-effective energy efficiency opportunities by applying financial and reputational drivers. The CRC Scheme aims to overcome many of the specific barriers addressed in section 2.2 – including bounded rationality/"not front of mind" and lack of information. The Scheme aims to make energy efficiency a board-level priority. We have recently consulted on a number of changes to simplify the scheme whilst maintaining these benefits, and will respond to this consultation shortly.[70]

9. **The Green Deal** also applies to non-domestic properties; it is designed to help those unable to fund the up-front investment in efficiency measures, and its unique design (with any loan transferring from tenant to tenant) helps overcome landlord-tenant split incentives.

10. **The Enhanced Capital Allowances** scheme[71] for energy saving technologies allows businesses to claim a 100% first-year capital allowance on investments in equipment that meets certain energy- saving criteria (products are listed on a monthly basis on the Energy Technology Product list[72]) and include lighting controls and Heating, Ventilation and Air Conditioning equipment.

11. The Government has committed to requiring all new non-domestic buildings to be built to **zero carbon standards** from 2019. Therefore the Building Regulations are expected to drive the majority of electricity demand reduction that could be addressed in new buildings. Building Regulations also place minimum efficiency standards on the installation of new heating, ventilation and air conditioning systems.

12. Other policies, including the Climate Change Levy and EU Ecodesign Framework Directive, also target electricity consumption in this sector.

Domestic products and appliances

12. Policy is a major driver of the efficient use of electricity in the use of domestic products, most notably two key EU Directives that mandate energy efficiency and labelling standards for certain product categories.

    i. The **Eco-design of Energy Using Products Framework Directive** ('Eco-Design Directive)) puts in place regulated energy efficiency standards for certain products. These standards effectively ban the

[70] http://www.decc.gov.uk/en/content/cms/consultations/crc_simp_cons/crc_simp_cons.aspx
[71] http://etl.decc.gov.uk/etl
[72] http://etl.decc.gov.uk/etl/find/

most inefficient products from being placed on the market. Minimum standards are already in place for a wide variety of domestic appliances including televisions, lighting, refrigerators and freezers, washing machines and dishwashers. Over time, it will include more products (such as computers and water boilers) and, when existing standards are reviewed, may introduce tighter standards[73].

ii. **The Energy Labelling Framework Directive** mandates EU energy efficiency product ratings at the point of sale, based on a standardised formula that gives certain products a relative ranking (formerly the A to G label, classes now extended to A+, A++ and A+++).

13. Because these are an EU responsibility, the UK cannot mandate stricter standards on its own or go faster than the European negotiation process, so any policy that goes further must be undertaken on a voluntary basis[74]. This applies to non-domestic products as well.

14. A number of voluntary schemes already exist, such as the **Energy Saving Trust Recommended Scheme** which provide a 'Best in Class' label, which is paid for by manufacturers and endorses the 20% most efficient products of any product category and sets minimum performance criteria for a range of energy-using products.

15. The UK has also trialled voluntary agreements with retailers on a product by product basis to remove the least energy efficiency products from retail shelves (known as '**choice-editing'**). The most successful of these was the pledge to stock only energy-efficient light bulbs in advance of EU legislation.

16. In the past, a number of energy supplier obligations such as **the Carbon Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP**) have applied to products in the domestic sector. These schemes will finish by end December 2012, and will be replaced by the Energy Company Obligation (ECO) which focuses on 'hard to reach' energy efficiency measures such as solid wall insulation and space heating for vulnerable households, as opposed to consumer products or appliances.

Non-domestic products and appliances

17. As with domestic products and appliances, there are two key policies:

- **Ecodesign Framework Directive** – as described above, this policy covers a wide range of products. Coverage is less extensive in the commercial sector, though many additional commercial products are expected to come under the regulation in the coming years.

[73] For a full list of products covered currently and planned see Annex 3

[74] Other EU requirements include EU legislation in 2010 to mandate that all new appliances sold use only one watt in standby mode. In this case, Europe legislated to enforce an IEA campaign ('the One Watt Initiative') which set an international challenge to achieve this by 2010.

- **EU Energy Labelling Framework Directive** – as described above. To date the focus has been on domestic products, mainly 'white goods' like fridges, washing machines and dishwashers, but there is scope to include non-domestic products in the future.

18. The above regulations are often known as "products policy". It is an EU competency and as with non-domestic products, further moves within the UK can only be done made on a voluntary basis by bilateral agreements. The Government believes in a high level of ambition in this area and continues to push the EU to extend the scope and impact of energy labelling.

19. **The Enhanced Capital Allowance scheme**[75] allows businesses to claim a 100% first-year capital allowance on investments in equipment that meets certain energy- saving criteria (products are listed on a monthly basis on the Energy Technology Product list[76]). Eligible non-domestic products and appliances include certain refrigeration equipment, motors and drives and uninterruptable power supplies. The financial incentive provided by the scheme helps to raise the profile of efficiency within the purchasing decisions of businesses and in doing so helps address the bounded rationality barrier as well as improving returns.

20. The ECA faces challenges for some products and appliances – for example those, like IT, that have a high rate of technological development and a broad range of functions. Reasons that these are problematic include that many of them do not have independent standards (e.g. ISO, EN or BS) that can be used to assess the energy efficiency characteristics of the product or simply define what is or is not a qualifying product; and separately that the evolution of these products is such that they quickly become outdated and therefore support could be provided for very short periods of time that might confuse rather than inform businesses procurement activities. The normal process for updating the Technology list takes many of these factors into consideration anyway and hence this consultation will not consider changes to the ECA scheme for non-domestic products and appliances.

21. **The CRC Energy Efficiency Scheme** – All organisations in the UK that have at least one settled half hourly electricity meter and used more than 6,000MWh of electricity in 2008 are included within the CRC Scheme. Organisations required to participate must monitor their energy use and purchase allowances for each tonne of CO_2 they emit that falls within the scheme. The more CO_2 an organisation emits, the more allowances it must purchase. This provides an incentive for organisations to reduce their electricity use. An annual league table is published ranking all CRC participants according to their energy efficiency.

22. In broad terms the scheme aims to encourage efficiency by using cost, behavioural and reputational levers. Companies may decide for themselves on the level and form of action they wish to take and this may include reducing

[75] http://etl.decc.gov.uk/etl
[76] http://etl.decc.gov.uk/etl/find/

electricity use by ensuring products and appliances that are purchased are more efficient.

23. **European Energy Star Programme** – this voluntary labelling programme was developed by the US where it identifies the most energy-efficient products on the market. Since 2000, the EU has had an agreement with the US to use the label for office computers, displays and imaging equipment[77]. Participants in the manufacturing and supply chain can label products that meet minimum energy efficiency standards and may register with the European Commission. Products also appear on an online database. This programme directly tackles failures of information giving the opportunity for many office products not regulated under the EU Labelling Framework Directive to communicate energy efficiency credentials via another label.

Industrial Processes

24. The **Climate Change Levy (CCL)** is an energy tax which was introduced to encourage businesses to become more energy-efficient and reduce their greenhouse gas emissions. It is a tax on supplies of electricity, gas, solid fuel and liquefied petroleum payable by industry, commerce and the public sector.

25. **Climate Change Agreements (CCAs)**, introduced alongside the CCL, provide energy intensive industries a discount from CCL (currently 65%, rising to 90% for electricity in 2013) provided they meet targets for improving their energy efficiency or reducing their carbon emissions. CCAs are in place for 54 industrial sectors and set the terms under which eligible companies may claim the levy reduction.

26. **The CRC Energy Efficiency scheme,** which is described in earlier sections.

27. The **Enhanced Capital Allowances** scheme, also described above. Many of the technology categories covered by the ECA scheme are relevant to industrial processes.

28. **The Ecodesign Framework Directive** for Energy Related Products 2009 although currently to a lesser extent than some of the other sectors. The Commission has launched preparatory studies on compressors, special motors and pumps but these are for waste water, swimming pools and aquariums rather than industrial processes.

[77] http://www.eu-energystar.org/en/database.shtml

Annex 2: Summary of Updated Analysis

1. Following internal work and analysis by McKinsey & Co, a draft report on the electricity efficiency potential was published for comment on the DECC website[78] in July 2012. DECC developed this analysis to inform the potential for electricity efficiency in the UK, improving the available evidence base by bringing together DECC's long-term energy projections and McKinsey's expertise and global database of energy efficiency measures. Respondents peer-reviewed the report and provided comments, which were used to refine and improve the report. The revised report and responses to the initial consultation are published alongside this Consultation Document. Many of the issues that were raised have been addressed, but some could not be addressed in this initial round of analysis, and these are described below. As set out in the Energy Efficiency Strategy, it is a priority to improve our understanding of the potential for energy efficiency and the effectiveness of existing policy. This analysis presented here should therefore be regarded as indicative at this stage. We welcome further feedback from respondents to help us improve the evidence in this area.

2. The report reflects UK demand patterns using DECC's "top-down" demand projections which are based upon high-level econometric projections of demand, as published externally[79] in October 2011. It was not possible to integrate the most recent demand projections, updated in October 2012, into the analysis. The updated demand projections have a marginally different profile of demand growth, with projected demand in 2020 around 4% lower than the 2011 analysis and the projected demand in 2030 around 4% higher.

3. The evidence base and existing models do not at this point provide sufficiently detailed UK-specific estimates of electricity end-use demand and energy efficiency measures (and corresponding investment projections) based on primary data collection across the whole economy. As we improve our evidence base, we will look to improve our estimates of the potential for energy and electricity efficiency. The potential for cost-effective abatement as estimated in the report is sensitive to several factors:

    - *Cost of Measures* - Though the analysis draws upon extensive knowledge of the international experience of the costs of energy efficiency measures from multiple countries, the extent to which this international experience is applicable to the UK is uncertain.

[78] http://www.decc.gov.uk/en/content/cms/emissions/edr/edr.aspx

[79] http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx

- *Effectiveness of Measures* - Whilst the analysis reflects UK energy consumption patterns, it has used a variety of other developed countries experiences to project the energy savings potential of energy efficiency measures in the UK. The UK's building stock and building-regulations are different to those of other developed economies, and more detailed research is required to establish how international experience is transferrable to the UK.

- *Underlying levels of Demand* - The analysis is consistent with DECC's demand projections, as published externally[80] in October 2011. Actual demand may be different to these projections for a variety of reasons – economic growth, population growth, the number of households, and the relationship between energy demand and economic growth.

- *Investment hurdle rates* - The analysis is sensitive to the assumed investment hurdle rates, and the ease of obtaining finance.

- *Cost of energy* - The analysis is sensitive to the assumed cost of electricity, gas and CO_2 emissions. Lower projected energy costs would imply lower abatement potential and make the investment less cost attractive.

- *Hidden / transaction costs* - The analysis does not include the potential hidden or transaction costs that might exist for electricity efficiency products. These could be significant and further work is needed to better understand these costs, which may act as a barrier to investment.

- *Impact of Government policies* - The extent to which existing Government policies will capture some of the estimated potential is difficult to determine with precision. Further work on understanding the potential for energy efficiency and assessing effectiveness of existing policy measures is being taken forward to improve the robustness of estimates.

- *Rebound in electricity demand* - The analysis undertaken so far largely excludes the so-called "rebound effect" associated with energy-efficiency measures, though the estimates of the energy savings from insulation take into account the direct rebound effect (comfort taking). The direct rebound effect is where in response to lowering the cost of energy services as a result of an energy efficiency measure, the consumer increases demand for that energy service, for example, if households previously living in cold properties take advantage of the relatively lower costs associated with meeting a desired internal temperature by consuming more energy. The direct rebound effect in the business setting is where a company produces more output once energy costs of production are lowered. This direct rebound effect is beneficial to society (it enhances the welfare of those that consume the energy) but reduces the energy savings associated with measures in particular circumstances (offsetting some of the welfare gains from the additional consumption). Energy efficiency measures can also have an indirect rebound

80 http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx

effect – households and businesses who reduce the costs of delivering the energy services they demand will free up income to spend on other goods and services, some of which will require energy in their production or consumption. As we develop our understanding of potential electricity demand reduction measures, we will consider appropriate assumptions for the rebound effect.

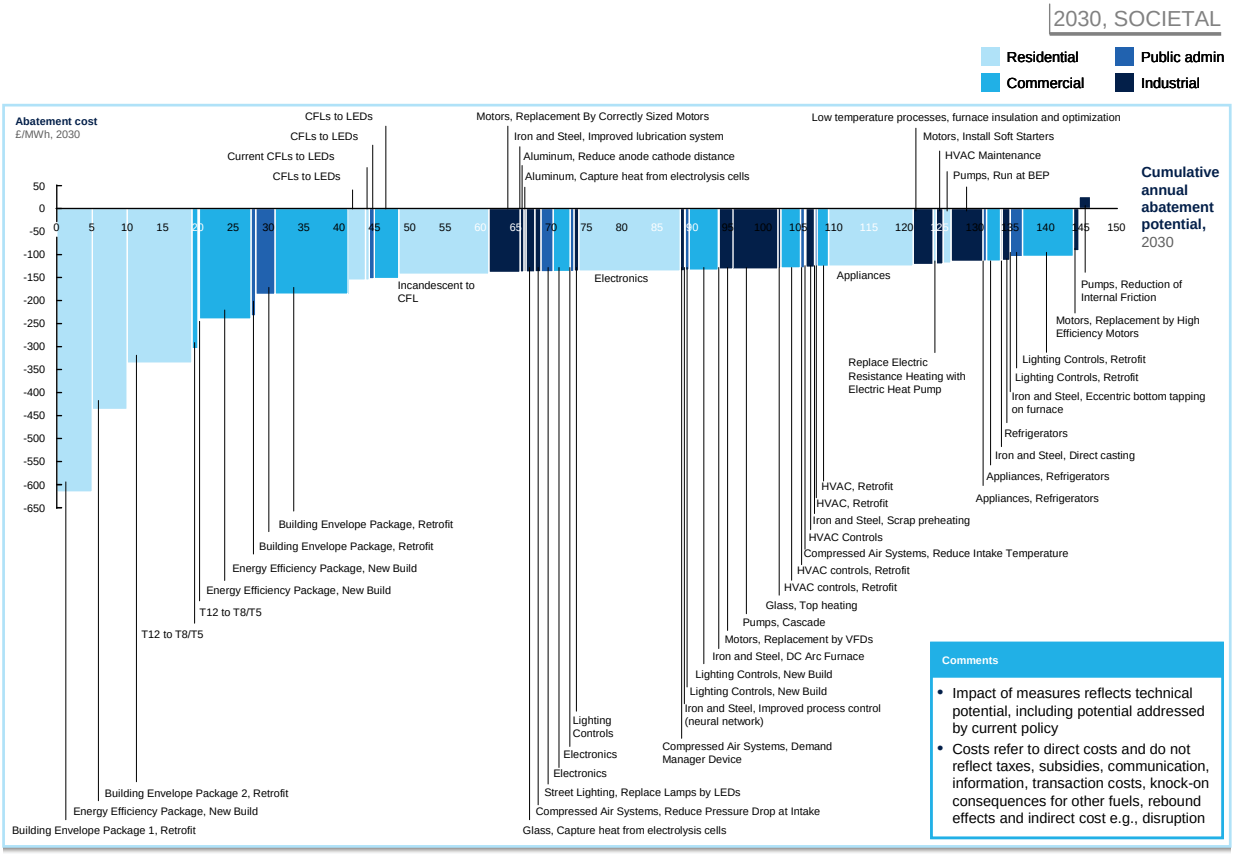
4. Reflecting the range of factors that influence the potential for cost-effective energy-efficiency measures, there remains uncertainty as to the abatement potential and cost of abatement, and the research estimates should be seen as indicative/illustrative of the electricity efficiency potential, rather than as precise point estimates. When considering the development of specific policy options, DECC will continue to develop its analysis of the potential for cost-effective energy investment measures.

5. DECC would welcome further evidence and analysis to support and increase our understanding of the potential for cost-effective energy-efficiency measure, the abatement potential and cost of abatement. (Please see Question 1)

Methodology

6. The purpose of a Marginal Abatement Cost Curve (MACC) is to present all the measures that can reduce electricity demand (or more usually carbon emissions) on a consistent and comparable basis to facilitate prioritisation. Examples of the MACC used in this project (EDR-MACC) are provided below as Figure 1 and Figure 2. The x-axis measures the potential of electricity saving in a given year. The y-axis represents the cost-effectiveness of a measure: measured as £/MWh of electricity saving. A negative abatement cost implies the investment is cost effective, under the assumptions underpinning the MACC.

Figure 1: Electricity Marginal Abatement Cost Curve 2030 – Societal View



Note: Key assumptions for 2030: Discount rate: 3.5%, Electricity price: 12p/kWh, CO2 price: £74/tCO2e; estimated on 2030 'policy off' baseline

7. The EDR-MACC, which is based on the Global Abatement Cost Curve methodology used by McKinsey & Company, develops each investment lever, such as the replacement of incandescent bulbs with CFL bulbs, using corresponding estimates of percentage electricity efficiency savings and incremental cost of implementing the measure. These estimates are based on extensive knowledge of energy efficiency measures, drawn from a range of globally-sourced evidence (from the International Energy Agency (IEA) as well as the UK, US, Germany, Sweden, Japan and other countries). For ease of prioritisation, we have grouped some related measures into 'packages'[81]. This is evident when discussing improvements to the building fabric and means that in this area, the evidence could be less granular than that held by DECC through other research.

8. The EDR-MACC is essentially a snap-shot of the cost and benefits of the investment in a particular year. It considers the benefits occurring within the year, whilst the capital costs of the investment are converted to an annual annuity charge by assuming that the investment is financed over the life of the asset, at the relevant discount rate.

[81] Details of the "packages" are presented in the analytical report.

9. While MACCs incorporate financing costs, the analysis does not consider the feasibility of long-term financing for the measures. This may mean that some measures which appear cost-effective in the analysis would be difficult to finance, the report highlights where availability and cost of financing are identified as barriers to realisation of the energy efficiency potential. In addition, the EDR-MACC does not include disruption/transactions costs when considering the cost-effectiveness of measures, nor does it directly address the risk that the investment does not deliver the assumed energy savings or that it may be more expensive than estimated. The impact of disruption costs are considered in later sections of the analytical report analysing the barriers to implementation.

10. The order in which the energy efficiency measures are assumed to be undertaken is determined by the net cost of the measure, with the measure with the lowest net cost expected to be undertaken first and the most expensive measure last. The potential electricity savings associated with each of the measures is influenced by the order in which they are undertaken. For example, the savings achievable by a buildings insulation package are affected by the total amount of electricity used by the heating and air conditioning system, which in turn depends on the efficiency of the system.

11. When estimating the abatement potential, underlying demand projections reflect a "Policy-Off" assumption i.e. a business as usual baseline that excludes policies that have been introduced since 2009. The estimates of the impacts of government policy are based upon DECC's analysis, as set out in DECC's updated energy and emissions projections published in October 2011.[82]

12. The report estimates two different EDR-MACCs, as society and a private individual/business value the benefit of an investment differently, as detailed below.

EDR-MACC from a Societal Perspective

13. The MACC from a societal perspective considers the net societal benefits resulting from the energy efficiency investment – reduced use of electricity, lower CO_2 emissions and where appropriate lower consumption of gas, offset by the cost of the energy efficiency measure. Lower energy consumption and lower CO_2 emissions where appropriate are valued at the marginal resource cost of energy and CO_2[83], rather than the retail price. The societal MACC analysis assumes that the capital costs are spread over the lifetime of the measures using a 3.5% real cost of finance.

EDR-MACC from a Private-Sector Perspective

14. The MACC from a private sector perspective considers the net benefits to a private-sector individual/company resulting from the energy efficiency investment – reduced use of electricity, and where appropriate lower

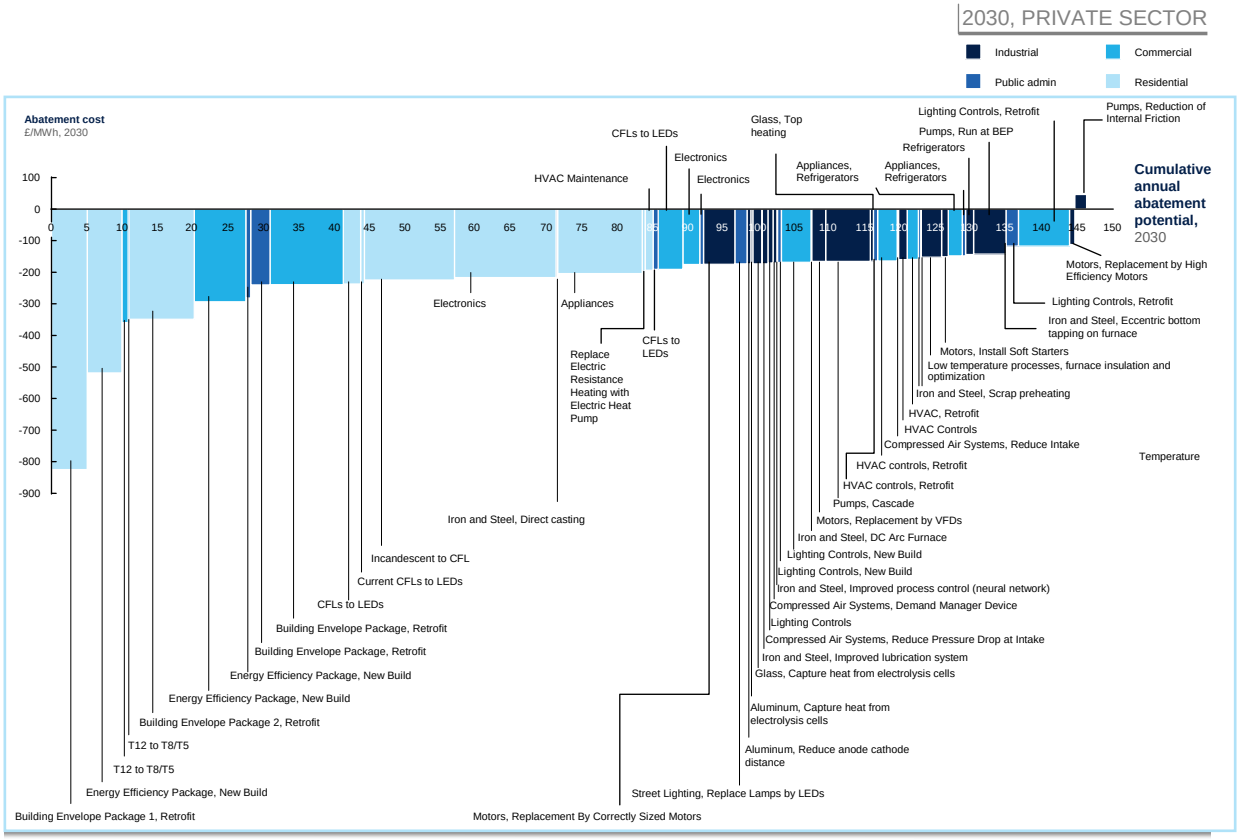
82 http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/price_bill_imp/price_bill_imp.aspx#

83 http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx

consumption of gas, offset by the cost of the measure. Lower energy consumption is valued at the retail price of energy[84]. The MACC analysis assumes that the capital costs are spread over the lifetime of the measures using a 7% real cost of finance.

15. This work has identified that there could be around 146 TWh of potential for measures that reduce electricity demand in 2030 based on today's known technologies[85]. Many of the measures identified are likely to be implemented (at least in part) in response to existing and planned policy measures – for example the phasing out of incandescent light bulbs. Once the impact of such policies is taken into account, the analysis suggests that up to 92 TWh of potential could remain untapped without additional policy interventions.

Figure 2: Electricity Marginal Abatement Cost Curve 2030 – Private Sector View[86]



Note: Key assumptions for 2030: Discount rate: 7%, Electricity price: 22p/kWh (residential), 18p/kWh (services), 17p/kWh (industry)

Comparison to the Energy Efficiency-Marginal Abatement Cost Curve.

16. The Energy Efficiency-Marginal Abatement Cost Curve (EE-MACC) published in the Energy Efficiency Strategy estimates for the potential for saving energy as a

[84] http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx
[85] This is relative to a baseline that includes no Government policies to reduce electricity demand since the Low Carbon Transition Plan in 2009
[86] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

result of energy efficiency measures across the whole economy.[87] This analysis suggested that overall socially cost-effective investment in energy efficiency by 2020 could save around 196TWh across a range of energy-sources. The net impact of realising this potential would be a 69TWh reduction in electricity demand.

17. There are differences in the methodology between the EE-MACC and the EDR-MACC approach described above, so the findings are not directly comparable. The EE-MACC is based on assessments of the potential for energy savings based on UK specific data, across the whole economy and includes all fuels. The EE-MACC is consistent with DECC's updated energy and emissions projections and supplementary Green Book Guidance appraisal guidance published in October 2012, whilst the EDR- MACC was initially published in July 2012 and is consistent with guidance published in October 2011. The EE-MACC assumes that measures are paid for up-front, and all benefits are discounted at the social discount rate. For more detail on the EE-MACC see Annex E of the Energy Efficiency Strategy.

[87] DECC, The Energy Efficiency Strategy. November 2012
http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx

Annex 3: Coverage of the EU Eco-Design Directive

Minimum standards already prescribed for:

- tertiary-sector lighting equipment (street lighting and office lighting);
- stand-by and off-mode electricity losses;
- external power supplies and simple set-top boxes for digital reception of television signals;
- televisions;
- domestic lighting;
- electric motors;
- domestic refrigerators and freezers;
- washing machines;
- dishwashers;
- fans, circulators.

Minimum standards under development for consideration in next few months:

- boilers and water heaters;
- computers and displays;
- imaging equipment;
- commercial refrigerators;
- pumps, room air-conditioners.

Future mapping (pipeline products under consideration for next few years):

- food-preparing equipment;
- network, data processing and data storing equipment;
- sound and imaging equipment;
- transformers.

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