15 **Title: Electricity Demand reduction initial impact assessment** **IA No:** **Lead department or agency: Department of Energy and Climate Change** **Other departments or agencies:**	Impact Assessment (IA) **Date:** 29/11/2012 **Stage:** Development/Options **Source of intervention:** Domestic **Type of measure:** Other **Contact for enquiries:**

Summary: Intervention and Options

Initial Impact Assessment

Cost of Preferred (or more likely) Option

Total Net Present Value	Business Net Present Value	Net cost to business per year (EANCB in 2009 prices)	In scope of One-In, One-Out?	Measure qualifies as
£m	£m	£m	Yes/No	In/Out/Zero Net Cost

What is the problem under consideration? Why is government intervention necessary?

A range of market failures and barriers hold back organisations and households from deployment of efficiency measures and accessing the associated electricity savings. These barriers include split incentives, imperfect information, bounded rationality and high hurdle rates. If further policy could overcome these barriers cost-effectively there is the potential to reduce societal costs through deployment of efficiency measures. These cost savings would accrue to those individuals or businesses investing in efficiency measures, in the form of reduced electricity bills. In addition there would be wider benefits to society in terms of less exposure to security of supply risks, economic growth opportunities and potential air quality improvements.

What are the policy objectives and the intended effects?

The key policy objective of this work is to **drive permanent electricity demand reduction** (where it is cost effective) by overcoming market failures and barriers impeding the take-up of efficiency measures. The socially-optimal deployment of energy efficiency measures will lead to the de-carbonisation of the economy at a lower cost than otherwise.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Policy development work is at an early stage. The barriers to take-up of efficiency measures have been identified on a sector-by-sector basis, as has the existing suite of policies and its impact on these barriers. This IA considers the policy options which may be able to address the remaining gaps in the policy landscape, focussing on the following types of policy options:

- Information schemes and voluntary approaches
- Mandatory standards
- Financial support; including targeted financial incentives and market wide schemes.

No preferred options have been identified at this stage. Final policy recommendations will be developed following the consultation.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** Month / Year

Does implementation go beyond minimum EU requirements?			**Yes / No / N/A**		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro Yes/No**	**< 20 Yes/No**	**Small Yes/No**	**Medium Yes/No**	**Large Yes/No**
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:**	**Non-traded:**	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister: ..... Date: .....

Summary: Analysis & Evidence — Policy Option 1

Description:

FULL ECONOMIC ASSESSMENT

Price Base 2012	PV Base 2012	Time Period 18 years	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate:

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional	Optional	**Optional**
High	Optional	Optional	**Optional**
Best Estimate			

Description and scale of key monetised costs by 'main affected groups'

Other key non-monetised costs by 'main affected groups'

The cost of action by government to encourage demand reduction via a range of policies is currently unknown but as the work programme progresses we will need to ensure that costs do not exceed potential benefits. Research has identified up to 92TWh of untapped technical potential for electricity savings, much of which could be achieved at negative cost to society. However, this analysis does not take full account of 'hidden' costs and further work is required to estimate these and identify the potential scale of cost-effective potential. Given the difficulty developing robust data on these aspects, options which allow for an element of cost discovery will have advantages.

BENEFITS (£bn)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low		Optional	**Optional**
High		Optional	**Optional**
Best Estimate			

Description and scale of key monetised benefits by 'main affected groups'

Main benefits areas of electricity demand reduction are made up of savings in generation capital costs, generation operation costs (including fuel), carbon costs and transmission and distribution costs.

Other key non-monetised benefits by 'main affected groups'

The non-monetised benefits include less exposure to security of supply risks, air quality improvements and potential for harnessing 'green growth'. There may also be leadership benefits in demonstrating low cost decarbonisation.

Key assumptions/sensitivities/risks — **Discount rate (%)** 3.5%

The level of additionality with existing policies and between policies
The business as usual uptake and therefore resulting deadweight loss
The distributional implications of policies
The assessment of policy options is currently purely qualitative.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs:	Benefits:	Net:	Yes/No	In/Out/Zero Net Cost

Background

The Electricity Demand Reduction (EDR) project was initiated by the following commitment made in the Electricity Market Reform White Paper in July 2011:

"We will 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"

The project is investigating whether there is a case for further policy intervention to reduce electricity demand, over and above the existing energy efficiency policy suite including products policy, CRC Energy Efficiency Scheme, Climate Change Agreements and Green Deal/ the Energy Company Obligation (ECO)[1]. Policy to promote demand reduction is likely in practice to mean policy to promote the uptake of energy efficiency technologies, such as higher efficiency motors, electrical products, lighting control measures or other building efficiency measures. Demand reduction could also be achieved by behavioural change, but this area of policy is less well developed than that for capital investment in energy efficiency.

The EDR project considers demand reduction and not demand response:

EDR refers to *permanent* reductions in electricity demand, due either to installation of more efficient equipment or permanent changes in behaviour such as switching office lights off at night

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.

Rationale for intervention

Barriers and market failures

There is extensive literature on market failures and barriers affecting the take-up of energy efficiency opportunities[2,3,4]. This is further supported by two research projects which used interviews with a variety of businesses in the non-domestic sectors to understand more about the barriers affecting their take-up of opportunities to save electricity in the context of both buildings fabric measures and industrial processes. These were:

1. The analysis undertaken with McKinsey[5] in spring 2012 which incorporated an investigation of the barriers and market failures impeding take-up of efficiency measures as well as an analysis of the technical potential for further electricity savings and the extent to which the existing suite of policies will unlock this potential; and
2. The Carbon Trust/ SPA project: a study by Carbon Trust and SPA Future Thinking[6] which has considered the key barriers to take up in the context of its purpose to investigation of the potential for financial incentive schemes to overcome these barriers and lead to reduced electricity consumption.

[1] Note that due to their impact on heating technologies primarily, GD and ECO largely affect gas rather than electricity demand at the current point in time

[2] Jaffe, A. B. and R. N. Stavins, 1994. The Energy Efficiency Gap – What Does it Mean? Energy Policy. 22 (10), pp. 804-810. Available at: http://www.hks.harvard.edu/fs/rstavins/Papers/The%20Energy%20Efficiency%20Gap.pdf

[3] Ryan, L, 2011. Energy Efficiency Policy and Carbon Pricing. Paris: International Energy Agency (IEA). Available at: http://www.iea.org/publications/freepublications/publication/EE_Carbon_Pricing-1.pdf.

[4] O'Malley, E., S. Scott and S. Sorrell, 2003. Barriers to Energy Efficiency: Evidence from Selected Sectors. Dublin: The Economic and Social Research Institute

[5] Capturing the full electricity efficiency potential of the UK: http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

[6] Exploring the design of policies to increase the efficiency of energy use within the industrial and commercial sector: http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

Drawing together these sources of evidence it is clear that there are a range of market failures and barriers impeding take-up of electricity demand reduction measures. As a result there is likely to be under-investment by the market in technologies which save electricity and hence an over-consumption of electricity relative to the social optimum. The key market failures and barriers are:

Market Failures

- **Split incentives** – there are challenges wherever there is a split between the party responsible for making up-front investments in equipment, versus the one using this equipment. This occurs in the split between a landlord and a tenant, where the landlord is responsible for funding an upgrade to say a lighting system, but the tenant would capture the benefits associated with lower ongoing bills. Equally, this can be the case where facilities management is outsourced to a third party.

  Split incentive issues are particularly relevant to the commercial sector due to the high share of commercial property which is rented: 61% of commercial office space is rented, and 75-80% of office space is managed by a third party[7]. In many such contracts, the buildings manager has no performance incentives related to saving energy and hence no incentive to pursue this. The three measures with the highest potential in the services (commercial plus public administration) sector are building efficiency improvements, lighting controls and Heating Ventilation and Air Conditioning (HVAC) measures[8]. All of these are potentially affected by the split incentive issues identified in this sector.

- **Imperfect Information** – organisations and households are not specialists in electricity efficiency products or the efficiency of products and appliances and would need to apply time and resources to become a specialist, which would potentially eroding any financial benefit that more efficient products could provide. These issues could be alleviated by an increased penetration of energy efficiency specialists acting as third parties to support decision making, but embryonic efficiency markets in the UK mean that such services are not common place. Additionally a retailer of products is incentivised is to sell products with the highest return irrespective of its efficiency**.**

- **Bounded Rationality** ("Not front of mind") – organisations and households make decisions about energy efficiency alongside a wide range of other criteria, often with limited time for decision making. 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 few critical parameters. This means that energy efficiency, which is not a front of mind issue, may often be disregarded, even where the decision-maker could have made cost savings by taking this into account.

- **R&D benefits;** innovation to improve the electricity efficiency of products or develop new electricity saving products is likely to be underprovided in the market because innovators will not capture the full benefits of their innovation.

Barriers to action

- **Hidden costs** – these are non-financial costs (including transaction costs) faced by consumers in undertaking electricity demand reduction projects. In order to capture the cost-effectiveness of an energy efficiency investment from both the investor and societal point of view it is essential to ensure costs such as searching for appropriate solutions, identifying reputable suppliers, shutting down production during installation or due to problems integrating new equipment are incorporated.

- **Hurdle rate/ payback period** – analysis undertaken with McKinsey identified that the rates of return which many potential investors were looking for were not achievable. Many respondents indicated that they were looking for payback of around 2 years,

[7] Analysis undertaken with McKinsey: http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx
[8] Ibid

whereas on average the measures considered have a pay-back period of around 3 years, with several measures having pay-back periods of over 5 years, though this depends on the sector under consideration. With such a high implicit discount rate, a whole range of energy efficiency technologies which are beneficial from society's point of view will not be taken up by the private individual or firm.

- **Risk and uncertainty** – this issue applies mainly in the industrial sector. Interviewees noted that risks associated with making changes to well-functioning equipment or processes in order to achieve energy savings brings risks, for example that the machinery will not restart or that a relatively untried technology will not prove to be successful.

Benefits of demand reduction

Evidence of Cost-effective Abatement Potential

DECC worked with McKinsey to identify the potential scale of demand reduction which could be achieved through the deployment of demand reduction technologies such as more efficient motors or lighting controls, if barriers to deployment could be overcome. The analysis concluded that there is indicative potential to make savings of up to 146 TWh in 2030 relative to Business As Usual (BAU), of which 54 TWh could be captured by existing policy. This leaves a potential to achieve additional savings of up to 92 TWh in 2030 through a new policy mechanism, should a cost-effective means of accessing this potential be identified.

Where electricity demand reduction measures could offer net electricity savings with a positive NPV there will be overall benefits to society of undertaking such measures. This is shown in the Marginal Abatement Cost (MAC) curve below. The purpose of a marginal abatement cost curve 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 curve demonstrates the range of measures that would have a net benefit on society (when they are below the x-axis, i.e. a negative abatement cost), presenting the technical potential across all sectors (regardless of whether this is expected to be captured by existing policies, not including 'hidden' costs[9]).

There are a number of significant differences between the analysis undertaken with McKinsey and the Energy Efficiency (EE) Strategy MACC[10]. The Energy Efficiency Strategy MACC takes a bottom up approach considering the maximum technical potential impact of all government policies. The analysis undertaken with McKinsey is based on their database on the potential for energy efficiency measures drawn on a range of experts. The McKinsey model was calibrated to DECC's October 2011 projections and assesses the potential for electricity demand reduction based on the estimated share of energy consumption at five year intervals. The model 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 McKinsey analysis might be difficult to finance. In addition, the McKinsey analysis does not include hassle costs within the NPV of measures.

The majority of the benefits will accrue directly to the firm or household undertaking the energy efficiency measures in the form of lower electricity bills. There may be a wider indirect impact on bills through the impact of the demand reduction on electricity system support costs or on the wholesale price of electricity; this is discussed in further detail below.

[9] Note: this work is still being quality assured and the numbers may change
[10] http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx#

DECC developed the 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. 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 should therefore be regarded as indicative at this stage.

The analysis reflects UK demand patterns using DECC's "top-down" demand projections which are based upon high-level econometric projections of demand, as published externally[11] in October 2011. 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.

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[12] 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

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

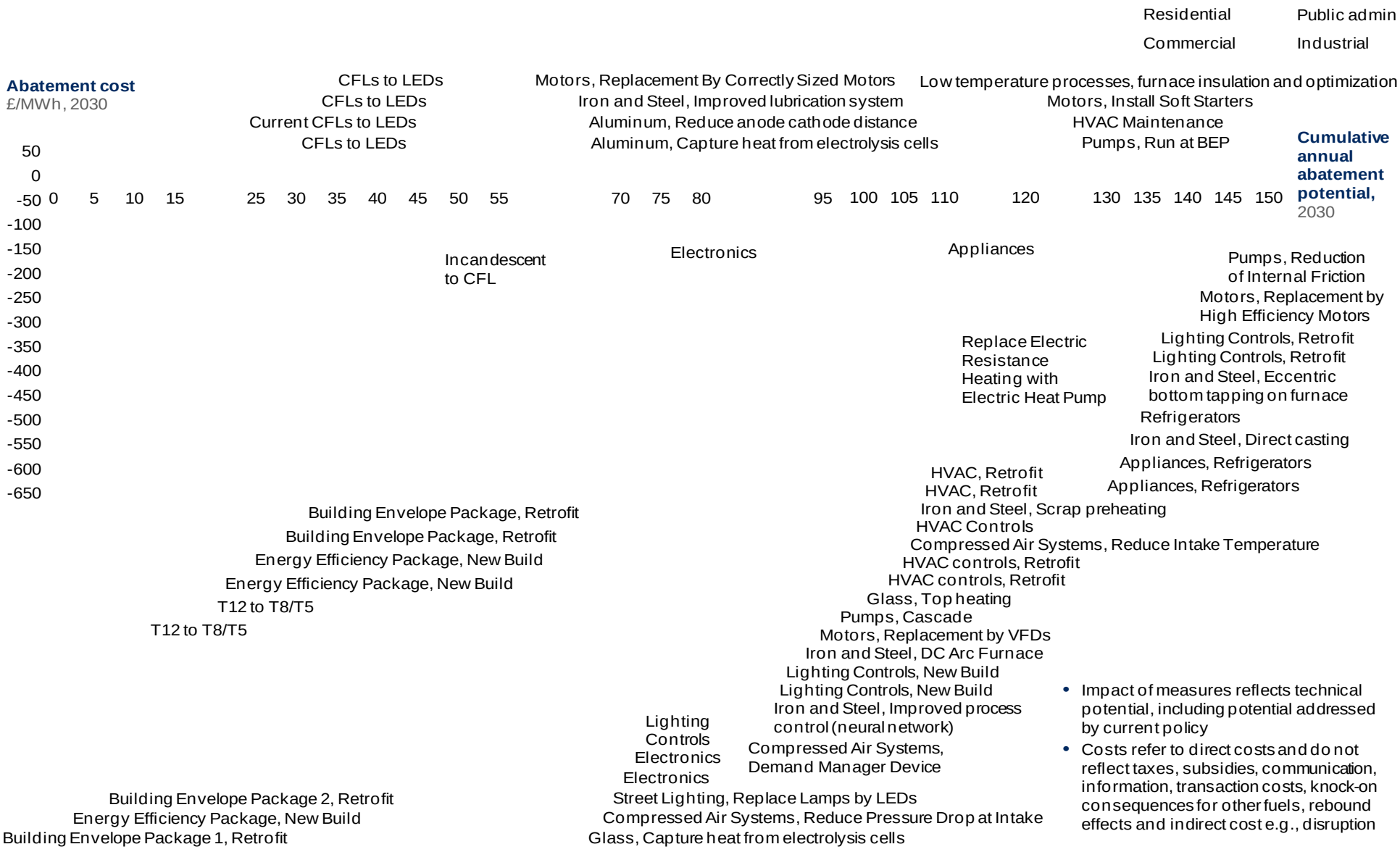
efficiency and assessing effectiveness of existing policy measures is being taken forward to improve the robustness of estimates.

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. An example of the direct rebound effect would be households previously living in cold properties taking advantage of the relatively lower costs associated with meeting a desired internal temperature by consuming more energy. The direct rebound effect occurs in the business setting 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 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.

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. 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.

Societal Marginal Abatement Cost Curve[13]



[8] From analysis undertaken with McKinsey. Note that this does not include hidden, transaction or hassle costs. DECC has also produced an Energy Efficiency MAC curve which can be found in the annex of EEADO strategy which also describes the difference in the approaches between the DECC and analysis undertaken with McKinsey.

EDR leads to lower electricity system costs

Taken together, internal DECC modelling using the Dynamic Dispatch Model (DDM) (see annex A) and the analysis undertaken with McKinsey indicates that the gross quantified benefit from a societal point of view from measures to reduce electricity consumption is around £105/MWh (the avoided electricity resource cost). This represents savings associated with generation costs (including operating, carbon and fuel costs), capital costs (investment in new generation plant) and transmission and distribution costs as a result of reduced demand. This does not include the wider benefits which are discussed below.

Further understanding of the costs of energy efficiency investments is required in order to estimate the share of the 92TWh of outstanding efficiency potential which could be accessed at lower cost than the avoided electricity resource costs, which is in the region of £105/ MWh over the period to 2030. The analysis undertaken with McKinsey undertakes this calculation, identifying the share of efficiency potential which is cost-effective from a societal point of view, i.e. taking into account the financial benefits of lower electricity resources costs and non-traded CO_2 emissions. However, not all hidden costs are taken into account within their calculations. Whilst further work is required to take hidden costs into account, the extent to which many measures are cost effective suggests that there will be cost-effective potential here, even once these costs are fully accounted for.

Impact on low carbon generation

Analysis indicates that key drivers of additional low carbon capacity build going forward will be the need to meet the 2020 Renewable Electricity ambition and the need to be on a trajectory to the Government 2050 decarbonisation target. As a result, demand reduction has only a limited impact on the amount of low carbon generation capacity which must be built in the period to 2030. The extent of the impact depends on how demand reduction would affect the least-cost low carbon trajectory to 2050. Under status quo demand assumptions, a target of 100gCO_2/ kWh for electricity sector emissions by 2030 is believed to be compatible with the least cost trajectory to 2050 and is used within the modelling to reflect the 2050 carbon target[14]. If demand were to decrease substantially the least cost route to 2050 (and therefore presumably also the level of emissions which the power sector would need to achieve by 2030) would change. Further work to investigate how demand reduction would affect this overall trajectory will be undertaken during the next stage of this project, but at this stage the only modelling available retains the standard DDM modelling assumptions.

Using these assumptions, including the 100gCO_2/ kWh constraint, the modelling indicates the size of the potential savings in support costs as a result of a shift towards a policy of EDR. *The support cost savings are substantially smaller than the resource cost savings*, as the majority of the total cost of delivering electricity is met through market revenues rather than subsidies. Hence, whilst the displacement of 1 MWh of electricity demand in the period to 2030 is modelled to reduce resource costs by around £105/ MWh, only between £4/ MWh and £11/ MWh is likely to be the support cost saving[15] (depending on the scenario modelled). Work to investigate how these values vary under alternative trajectories will be taken forward in the next stage of the project. For more detail please see Annex B.

[14] http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/carbon_plan.aspx

[15] This value of support cost savings is relatively low because only a portion of the generation displaced by EDR is in receipt of any form of support. There is a direct read-across to the renewables target: for every MWh of demand reduction achieved in 2020, the requirement for renewable electricity reduces by around 1/6 MWh. The payment under the RO to e.g. onshore wind is around £36/ MWh, and one sixth of this financial value falls within the range of £4 to £11 identified in the DDM modelling. Note that the assumption that the UK is working towards its 2050 path, which is embodied within the DDM model as a 100gCO2/ kWh target for the electricity sector in 2030, is key in driving the DDM results on both support and resource costs.

Externality benefits of further action to reduce electricity demand

The carbon benefit associated with many energy efficiency policies does not apply to an EDR policy because carbon externalities within the electricity sector are already internalised within decision making through the European Union Emissions Trading System (EU ETS) and Carbon Price Floor.

However there are a range of other external benefits which may result from a successful EDR policy:

1. **Economic growth:** Installing energy efficiency measures is often labour intensive, and has the potential to boost investment and employment and hence economic growth in the current economic climate. There are also long-term growth benefits. For example, lower domestic energy bills can lead to higher disposable incomes that can be spent elsewhere in the economy, while businesses can see a reduction in running costs and so an increase in productivity. Simple changes in energy use behaviour can deliver some of these benefits with little up-front cost.
2. 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.
3. **Security of supply**: an EDR policy should lead to a reduced requirement to import fuels, thus improving security of supply. It may also assist with ensuring strong capacity margins in the short- to medium-term where large volumes of coal plant is being retired due to environmental requirements.
4. **Leadership benefits**: a successful policy of achieving decarbonisation at lower cost may encourage other countries to take action.
5. **Air quality benefits** should result from reduced generation even if the carbon costs are already internalised.

Policy objectives

The key policy objective of this work is to **drive electricity demand reduction**. This includes ensuring that the policy:

- Overcomes market failures and barriers
- Ensures additionality to other policies and minimises deadweight loss from an inefficient market
- Is cost effective to monitor and evaluate
- Is flexible to change

In addition further policy objectives and aims are needed to ensure that policies produce the optimum outcomes for society, these include:

- The policy should be deliverable on the ground
- Implementation costs should be low and the policy should be relatively easy to deliver
- Project risks should be managed effectively

Options considered and evaluated

As this is an initial Impact Assessment a full range of possible policy options are considered. These have been split into separate groups by sector. The majority of the options are focussed on physical measures rather than behavioural change (but not exclusively) as this will be easier to monitor and evaluate and is likely to be sustained.

Policies that may be able to drive additional electricity demand reduction in the UK were identified through the following processes:

a) A bottom-up analysis of the barriers and market failures known to exist in implementing further UK electricity demand reduction, and consideration of policy options best suited to addressing those barriers and market failures.

b) Analysis of existing UK policies driving electricity demand reduction

c) A review of policy instruments used internationally, and consideration of relevance to the UK given the existing policy framework (do nothing option)

The different sectors are discussed below including an assessment of the technical potential for savings and the main barriers that are perceived, before presenting possible policy options and evaluating them against the policy objectives (Annex C presents the scoring methodology based on the policy objectives and a detailed matrix of the options scores).

The policy options fit into the following groupings:

- Information schemes and voluntary approaches – this includes all schemes that aim to improve knowledge for consumers as well as voluntary schemes that could either result in limiting choice for consumers or create an incentive to ‘compete’ in energy reductions.
- Loan schemes – aim to overcome access to finance and hurdle rate issues by providing finance for the purchase of electrically efficient products, potentially at a preferential rate.
- Mandatory standards – introduce legal targets or obligations to ensure that a certain level of electrical efficiency has been met.
- Targeted financial incentives – aim to directly support more electrically efficient products using a range of potential methods;

- Market wide financial incentives – aim to provide a central incentive/support structure to create energy savings across a range of sectors. There are potentially three options that could be considered. These are:
    - **Premium Payment**[16] for electricity efficiency. A price based scheme with an agreed price for a unit of demand reduction, which will result in demand reduction up to the point where the marginal cost of achieving reductions is reached.
    - **Capacity Market**. A capacity approach, providing a financial incentive to provide demand reduction specifically at times of system stress potentially partaking in the Capacity Mechanism. However, provisions could be put in place to ensure that reductions are made at all times.
    - **Energy Supplier Obligation** for electricity efficiency. A quantity based scheme where there is an obligation or incentive on suppliers to deliver an agreed quantity of demand reduction, which will be priced by the market.

More detail and assessment of the market wide schemes can be found after the sectoral policy options discussion.

Policy options are considered by sector below.

1. Domestic buildings

Domestic buildings efficiency opportunities include a range of measures that aim to improve the building fabric of homes to improve electricity efficiency. The table below presents estimates of the technical potential savings (including potential from existing policies) for the measures with the highest technical potential in 2030 for domestic buildings from the analysis undertaken with McKinsey. These are only initial estimates and should be treated with caution, given the caveats discussed above.

Table 1: Technical potential savings for domestic buildings in 2030[17]

Domestic buildings	**Technical Potential savings**
High standard of efficiency in new homes	5 TWh
Basic retrofit of homes	5 TWh
Deep retrofit of homes	9TWh
Total	**19 TWh**

The following key barriers and market failures for this sector have been identified:

- **Access to finance.** Efficiency measures require up-front investment, and households don't always have access to finance
- **Split incentives and landlord-tenant issues.** Where homes are tenanted, landlords are not incentivised to fund efficiency measures (as they do not pay the energy bill) and tenants may not fully recover the benefit of the investment within the period of the tenancy
- **Bounded rationality.** Given the complexities of decision-making, households may focus only on a couple of key parameters and ignore efficiency implications of their decisions, even where it would have been beneficial for them to have taken this into account
- **Imperfect Information.** People do not understand what measures are relevant to them

To attempt to overcome the above barriers and seek to drive the potential electricity savings the following policy options are considered:

Existing policies (Do nothing) – there are a range of existing policies in this sector, which include;

[16] 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,

[17] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

- Green Deal and Energy Company Obligation (ECO) – aim to tackle access to capital, information and landlord-tenant split incentive (since reasonable requests cannot be refused). The ECO is focussed on harder to treat properties and lower income and vulnerable groups.[18]
- Minimum standards in Private Rented Sector – likely to be set at EPC rating E from 2018 (as long as there is no net or upfront costs to landlords)[19]
- Smart Meters (SM) – expected to create behaviour change by overcoming information issues/bounded rationality. SM are estimated to create electricity savings on average of 2.8% per household[20]. However, this is the average of both electric heating and appliances.
- Renewable Heat Incentive/Premium Payment – currently provides support for heat pump installation through a grant to reduce the upfront cost of a heat pump (which is more efficient than traditional electric heating). The RHI will seek to provide a feed in tariff for the use of heat pumps[21].
- Building Regulations and Zero Carbon Homes – aim to make improvements to the building stock through changes to the Building Regulations, both for new build homes (Zero Carbon Homes[22]) and refurbishment of existing homes.
- Energy Performance Certificates (EPC) – it is mandatory to make an EPC available to the prospective buyer or tenant of any building that is sold, rented out or constructed[23]. This aims to overcome information failure at a point when action may be more likely (i.e. moving into a new home). The EPC, which, in combination with an Occupancy Assessment, acts as a basis for the Green Deal tends to offer higher potential scores from action to improve the efficiency of electrically heated homes. EPCs provide both an energy efficiency and an environmental impact rating both of which take account of a range of factors including the age, size and construction characteristics of the building. The energy efficiency rating also takes account of the cost of energy (the electricity price per kWh is currently significantly higher than gas).

As a consequence of these existing policies a large proportion of the technical potential for electricity savings presented in the above table is likely to be captured by existing policies. The remaining cost effective potential from physical measures is estimated to be around 5 TWh[24], although there is scope for further saving from behaviour change, which was not considered in the analysis undertaken with McKinsey.

Further policies that could tackle the remaining barriers and reduce the remaining electricity demand are:

a) **Information provision** – the EPC already aims to overcome information failures. By including the EPC in the Green Deal assessment there will be an increase in the use of, and therefore consumer engagement with, the EPC resulting in greater understanding of the potential products applicable to the individual household. Consequently information options are not considered further.

b) **A new scheme providing financing for domestic efficiency projects.**

Providing finance would overcome the barrier to efficiency measure that results when households cannot pay for measures up front - this is a significant barrier to building fabric efficiency measures in domestic homes. However the Green Deal is designed to provide no upfront-cost financing for measures – hence this option has been discounted.

[18] http://www.decc.gov.uk/assets/decc/11/consultation/green-deal/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf
[19] Ibid
[20] http://www.decc.gov.uk/en/content/cms/consultations/cons_smip/cons_smip.aspx#impact
[21] http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx
[22] http://www.communities.gov.uk/publications/planningandbuilding/zerocarbonia
[23] http://www.communities.gov.uk/planningandbuilding/sustainability/energyperformance/
[24] If expensive retrofit options with long payback periods are included this increases to 14 TWh.

c) **Targeted obligation for electrically-heated homes.** The existing Energy Company Obligation supports the installation of more expensive measures such as solid wall and hard to treat cavity insulation in domestic properties and also for measures installed in low income homes. It is primarily targeted at delivering reduction in carbon emissions and energy bills but it will also lead to reductions in electricity demand as many of these measures will be installed in electrically heated homes. The introduction of additional targeted incentives would not work to overcome any specific barriers and it would be very difficult to ensure additional energy savings (on top of those from ECO). Consequently this option has been discounted.

d) **Allowing domestic programmes to bid into a market-wide scheme.**

The model for this incentive would be to make available an incentive (or obligation) to "behaviour change specialists". The roll out of Smart Meters will provide consumers with much better information about how they use energy in the home. Smart Meters also provide the opportunity for new behavioural interventions. For example, there may be scope to encourage consumers to be more energy efficient though innovative communication combined with tailored recommendations. Organisations that are able to demonstrate they delivered verified electricity demand reductions could be eligible for financial payments or they could be obliged to create a set quantity of savings.

Experience from the US suggests that behaviour-change programmes have been effective though they have tended to concern mainly the demand for heating. However, the overlap with the expected benefits of smart metering merits further consideration - as does interaction with measures eligible for support through the Green Deal or ECO. Third party groups or aggregators would need to meet adequate Metering &Validation (M&V) criteria; there is some evidence of this approach working in US.

Conclusion

There is already a range of policies in this sector which aim to overcome the barriers identified and deliver savings for household energy use. The consultation document seeks views on whether a financial incentive would be effective in driving additional behaviour change and consequently electricity reduction.

2. Non-domestic buildings

Non-domestic buildings include the commercial, industrial and public sectors[25]. Measures that could reduce electricity demand in these buildings include more efficient lighting systems, heating and air conditioning, and draft proofing and insulation. The table below presents estimates of the measures with the highest technical potential for savings in 2030 (including potential captured by existing policies) for non-domestic buildings from the analysis undertaken with McKinsey. These are only initial estimates and should be treated with caution, given the caveats discussed above.

Table 2: Technical potential savings for non-domestic buildings[26]

Non-domestic buildings	**Technical Potential savings**
HVAC[27] controls – retrofit	6 TWh
Lighting controls – retrofit	10 TWh
Better lighting (LEDs and T8/5)	6 TWh
Other basic retrofit packages (e.g. draft proofing)	17 TWh
Replace HVAC	3TWh
Total	**c. 42TWh**

[25] The public sector in considered in more detail in the EEDO strategy document http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx

[26] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

[27] Heating Ventilation and Air Conditioning

As a result of discussions with the industry the following key barriers and market failures for this sector have been identified:

- **Bounded rationality.** Given the complexities of investment allocation and limits on managerial time, businesses may prioritise only certain key parameters in decision-making and hence ignore efficiency implications of their decisions
- **Imperfect Information.** Businesses don't know what measures are available and it costs them time and money to find out
- **Landlord tenant issues.** Around 60% of non-domestic buildings are tenanted. Landlords aren't incentivised to act (they don't benefit from lower bills) and tenants don't trust that investments will pay off within the time of their tenancy
- **Other split incentives.** Those responsible for managing a building (whether in-house or via external energy managers) may not have responsibility for minimising energy bills
- **Internal access to capital (high discount rates)** – unacceptable payback periods (for some measures). The payback period associated with some measures may not be sufficiently attractive to bring forward efficiency projects

To attempt to overcome the above barriers and seek to drive the potential electricity savings the following policy options are considered:

Existing policy (Do nothing) – there is a range of existing policies in this sector, which includes:

- CRC Energy Efficiency Scheme[28] – Incentivises energy efficiency improvements in large non-energy intensive organisations in the public and private sectors by mandatory reporting of energy consumption and the purchase of CRC allowances commensurate with their energy use.
- Non-Domestic Green Deal[29] – Aims to tackle access to capital[30] by providing finance for efficiency improvements at no up-front cost.
- Minimum standards in Private Rented Sector – Likely to be set at EPC rating E from 2018 (on the basis of no upfront costs to landlords) to overcome the split incentive market failure.
- Energy Efficiency Audits – A requirement that all businesses have expertly-conducted periodic audits of the energy performance, and efficiency opportunities, of both buildings and processes. This will be a future requirement under the EU Energy Efficiency Directive of which there is a forthcoming consultation.[31]
- Enhanced Capital Allowance Scheme – Allows businesses to claim 100% of tax relief if they choose plant equipment from an approved list of energy efficient equipment.
- Building Regulations – aim to make improvements to the building stock through changes to the building regulations, both for new build and existing properties.

As a consequence of these existing policies a large proportion of the technical electricity savings presented in the above table is likely to already be covered. However, analysis undertaken with McKinsey considered Government estimates of the impact of these policies on electricity demand, and compared this to the total technical potential expected. This analysis suggests there is significant remaining potential to go beyond existing policies and uncover additional cost-effective savings in this sector. A number of policies that might be able to drive additional demand reduction by further overcoming barriers in non-domestic buildings include:

[28] http://www.decc.gov.uk/en/content/cms/emissions/crc_efficiency/crc_efficiency.aspx
[29] http://www.decc.gov.uk/en/content/cms/tackling/green_deal/gd_customer/gd_nondomcust/gd_nondomcust.aspx
[30] http://www.decc.gov.uk/assets/decc/11/consultation/green-deal/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf
[31] http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

a) Provision of relevant and **bespoke information** about efficiency opportunities including **capacity building** (providing training and information for facilities management). The Energy Efficiency Deployment Office strategy[32] is considering this issue. As a result this option is not considered further.

b) **Access to finance scheme.** The Green Investment Bank and Non-Domestic Green Deal aim to support businesses struggling to access credit to fund up-front investment in efficiency. Additional policy would seek to provide loans beyond these.

   A pure financing scheme would overcome barriers around access to finance; although there is weak evidence from interviews that this is a significant barrier in this sector (businesses typically report they are able to access money, where they feel the investment is worthwhile). There are two major new policy interventions focused on access to finance in non-domestic sector: the Green Investment Bank and Non-Domestic Green Deal and therefore the space for additional policy is considered to be very limited. This option is therefore not considered further.

c) **Targeted financial incentive**. A mechanism to provide up-front payment for installing lighting controls, HVAC controls or LED lighting in non-domestic buildings (if these measures were recommended by an energy audit).

   A financial incentive in principle may grab attention, and so overcome bounded rationality (although there is no or little evidence about the rate that would have to be paid to do so). It may also help address the landlord-tenant split incentives for marginal investment cases. This would be the case for a landlord considering whether an efficiency investment will be paid back through higher rents. Likewise, a tenant may be considering whether an efficiency investment is likely to pay off within his expected tenancy. In both cases a small financial incentive may "tip" this decision over. However, the number of marginal cases to which this would apply is unclear. Delivery through a targeted mechanism might be more popular than a market-wide incentive, since the burden on project developers would be lower, and the rate of payment known "up front" by project developers. Initial research with commercial businesses suggested a preference for policy approaches that provide a list of pre-approved measures that are eligible for support[33].

   Depending on the measures included, this policy has the potential to drive uptake of key technologies. Coverage is likely to be lower than for a market-wide scheme, but participation may be greater due to the certainty that project developers would have. To ensure appropriate interventions support may be limited to measures recommended in an approved assessment or energy audit. However, there are significant challenges or risks for Government; assessing and deciding eligibility and levels of support would be a significant challenge – akin to the challenges around administratively setting support levels for Microgeneration. It would be important to explore options for competitive price discovery, which would be preferable.

d) **Market-wide financial incentive scheme –** payment for projects that demonstrate electricity demand reduction.

   The barriers targeted by a market-wide mechanism would be similar to those described for a targeted financial incentive, although delivery through a market-wide scheme may incentivise third party businesses to overcome barriers (e.g. bounded rationality) in exchange for claiming financial support for the kWh saved. Delivery through a market-wide incentive is likely to incentivise whole-property approaches, rather than individual components, but may have less take up than a targeted scheme, since the burden of proof on developers is likely to be greater. The policy has the potential to complement existing approaches and be relatively broad (anything in principle may be eligible, including behavioural change), and provide greater flexibility. However, there is a risk the

[32] http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx
[33] Carbon Trust and SPA Future Thinking Research
http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

administrative burdens may constrain the scope of delivery on the ground. Key complexities include Monitoring & Valuation and additionality, as well as establishing and running the scheme.

Conclusion

The consultation document seeks views on whether a financial incentive would be effective in driving additional demand reduction and whether the most effective means of delivering this would be through targeted finance or a market wide scheme.

3. Domestic products and appliances

Domestic products include a range of electrical products and appliances. The main opportunity to drive electricity demand reduction through products is to encourage people at the point of sale, towards the most efficient of available products. There may also be opportunities to save electricity by encouraging some very old and inefficient products to be replaced by more efficient versions. The table below presents estimates of the technical potential savings in 2030 (including potential from existing policies) for domestic products and appliances with the highest potential from the analysis undertaken with McKinsey. These are only initial estimates and should be treated with caution, given the caveats discussed above.

Table 3: Technical potential savings for domestic products[34]

Domestic products	Technical Potential savings
High efficiency appliances – at end of life, replace with a more efficient version	12 TWh
High efficiency consumer electronics – at end of life, replace with a more efficient version	14 TWh
Change from Incandescent lighting to LED lighting	16 TWh
Total	**42 TWh**

As a result of discussions with the industry the following key barriers and market failures for this sector have been identified:

- **Bounded rationality.** Given the complexities of decision-making, households may focus only on a couple of key parameters and ignore efficiency implications of their decisions, even where it would have been beneficial for them to have taken this into account
- **Information asymmetry. People do not understand** the relative benefits of more efficient products and potential money saved
- **Split incentives.** Those purchasing appliances may not be responsible for their running costs (e.g. landlords)
- **Access to finance.** Where more efficient products are more expensive, people may be unable to pay a premium for efficiency

To attempt to overcome the above barriers and seek to drive the potential electricity savings the following policy options are considered:

Existing policies (Do nothing) – there are a range of existing policies in this sector, which include;

- The EU Ecodesign Framework Directive[35] – Imposes minimum standards on the efficiency of products sold in the EU (hence overcoming all the barriers described, for the products in scope)

[34] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx
[35] http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm

- The EU labelling Framework Directive[36] – Requires consumers to be provided information (in a specified format) on the relative efficiency of products
- There are also voluntary labelling schemes such as the Energy Saving Trust Recommended Scheme[37] 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.
- Retail initiatives and trials, for example the voluntary early phase out of incandescent light bulbs

As a consequence of these existing policies a large proportion of the technical electricity savings presented in the above table are likely to already be covered. Of the total technical potential, the analysis estimated that approximately 60% is covered by existing or planned products policy (the EU Ecodesign and Energy Labelling Framework Directives) - that will target most major appliances and phase out the worst performers from the market[38].

One of the hurdles for further Government intervention is identifying cost-effective policies to target the remaining untapped technical potential. Given there are mandatory EU product standards in place that remove the 'worst' performing products from the market, one of the issues that requires further investigation is whether the value of the remaining potential EDR for each product will be high enough to justify the support required to incentivise its purchase. That said, the market failures listed above may mean there may still be room for further gains in how consumers purchase and use products in the domestic sector that can be supported by policy. Possible additional policies might include:

a) **Better labelling.** Improve existing mandatory labels, on a voluntary basis, so that consumers can easily assess the financial saving associated with buying a more efficient product through whole-life costs. As labelling is an EU competence, the provision of fuller information would need to be on a voluntary basis

   Better labelling e.g. to include approximate lifetime cost of energy consumed by the product, is expected to tackle information barriers. It may help overcome the landlord-tenant split (e.g. for white goods), if landlords believe they can better communicate the efficiency benefits of a property at the point of rental, though evidence is limited. Evaluation of past schemes (notably in Norway) show mixed results, depending on appliances and the expected savings. As a voluntary initiative with industry, this is a low risk option, but the voluntary nature means it will never have whole market coverage so its impact might be limited. This option would benefit from further investigation.

b) **Stricter mandatory standards on products** Remove more of the least efficient products from the market by having stricter standards on appliances and products.

   Mandatory standards are an effective way of overcoming barriers, including bounded rationality, information failure and split incentives (e.g. with landlords buying white goods). The EU Ecodesign Directive currently lays the minimum standards for the efficiency of products sold in the EU. It would be illegal under competition law to create unilateral mandatory standards in the UK, but the UK continues to drive for stronger action on EU standards. Due to the significant overlap with the EU Ecodesign Directive this option is discounted.

c) **Targeted financial incentive scheme - scrappage scheme to target certain products.** Financial support for high-efficiency products, subject to scrapping a low-efficiency version.

   This is an effective way to remove products from use that are inefficient as rules can ensure that products are indeed 'scrapped'. The presence of the scheme may be effective in overcoming bounded rationality by drawing attention to the opportunity (although the level of

[36] http://ec.europa.eu/energy/efficiency/labelling/labelling_en.htm
[37] http://www.energysavingtrust.org.uk/Organisations/Business-services/Energy-Saving-Trust-Recommended
[38] Directive 2010/30/EU and Directive 2009/125/EC

funding required to do this is uncertain and probably varies from product to product). However, there is a very high deadweight risk (boiler scrappage scheme evaluation suggests 96% of recipients would have replaced the boiler anyway) and there is potential to increase life cycle emissions and waste management costs due to the fact that replacement cycles are shortened. Therefore this option has been discounted.

d) **Allowing product-related measures support through (existing) supplier obligation.**

Energy efficient products and appliances are not eligible energy efficiency measures under ECO. This is due to their low individual contribution to carbon reductions and ECO's focus on harder to treat homes and support for those in fuel poverty. For these reasons it is not proposed that ECO is expanded to include product-related measures and this option has been discounted.

e) **Targeted financial incentive scheme (could be targeted or bid through the proposed market-wide scheme) - voucher scheme.** A "money back" voucher for purchase of high-efficiency appliances or electronics.

Targets similar barriers to a weighted VAT scheme, but delivery through a targeted/voucher scheme may be more "attention grabbing" than a weighted VAT scheme, as the reason for the support would be visible to the customer – it therefore tackles the market failure of bounded rationality. The level of support required is untested. Since there is no scrappage, the risk of causing unnecessary product disposal is lower, but the risk that this increases the total number of appliances in use is significantly higher. The administrative costs may be high due to the small incremental EDR from each product, and the institution running the scheme would need the capability to process a large volume of claims/vouchers. The support level and available electricity saving might not justify this cost.

f) **Market-wide financial incentive scheme** - allowing product-related measures to be rewarded and bid into the market wide incentive/obligation (via aggregators as there is likely to be a de minimus threshold). This could work with a similar customer facing voucher certificate described above.

A market-wide incentive may provide a route by which aggregators could claim for initiatives which encourage the choice of high-efficiency appliances/electronics, although this is untested. The level of support required is unknown. This policy could be targeted at the right barriers and market failures, but there could be significant deadweight risk given the range of policies already targeted at sector. Market wide schemes are always complex to administer. However, if the support is sufficient to attract aggregators into the scheme, the admin costs and complexity would fall to a third party – however the support necessary to encourage third parties to cover these administrative costs might be significantly higher than other EDR options.

Conclusion

The consultation document discusses whether better labelling and other voluntary measures would deliver demand reductions. Additionally the consultation document seeks views on whether a financial incentive would be effective in persuading consumers to purchase more efficient products and whether this offers a value for money solution in the domestic sector given existing EU product standards. And if so, whether the most effective means of delivering this would be through targeted finance or a market wide scheme?

4. Non-domestic products and appliances

Non-domestic products include a range of electrical products and appliances used within the commercial, industrial and public sectors[39] (as a general rule these include electrical items that are not considered fixtures or fittings). The table below presents estimates of the technical

[39] The public sector in considered in more detail in the EEDO strategy document http://www.decc.gov.uk/en/content/cms/tackling/saving_energy/what_doing/eedo/eedo.aspx

potential savings in 2030 (including potential from existing policies) for non-domestic products and appliances with the highest potential. These are only initial estimates and should be treated with caution, given the caveats discussed above.

Table 4: Technical potential savings for non-domestic products[40]

Non-domestic products	Technical Potential savings
Commercial electronics	3 TWh
Commercial refrigerators	2 TWh
Public sector electronics and refrigerators	1 TWh
Industrial refrigerators	1. TWh
Total	**7TWh**

As a result of discussions with the industry the following key barriers and market failures for this sector have been identified:

- **Split incentives.** Those purchasing appliances may not be responsible for their running costs (e.g. landlords, contractors, building managers etc)
- **Bounded rationality.** where businesses reduce complexity by taking only a few key factors into account when making decisions
- **Information asymmetry**. Businesses do not understand the relative benefits of more efficient products and potential money saved
- **Access to finance.** Where more efficient products are more expensive, businesses may be unable or unwilling to pay a premium for efficiency

To attempt to overcome the above barriers and seek to drive the potential electricity savings the following policy options are considered:

Existing Policies (Do nothing) – there are a range of existing policies in this sector, which include;

- The EU Ecodesign Framework Directive[41] – this EU directive is the key policy for reducing the number of inefficient products on sale. It imposes minimum standards on products sold in the EU. This reduces the impact of the barriers in the non-domestic sector, because there are fewer inefficient products to choose at the point of sale. Although this policy covers a wide range of products and many additional commercial products are expected to come under the regulation in the coming years. For this reason, extension of this directive is not considered below
- EU information requirements – requires certain technical information to be available at the point of sale for regulated products
- The EU Energy Labelling Framework Directive[42] – Sets labelling requirements, although to date this has primarily focused on domestic appliances
- Carbon Reduction Commitment (CRC) Energy Efficiency Scheme[43] – Incentivises energy efficiency improvements in large non-energy intensive organisations in the public and private sectors by mandatory reporting of energy consumption and the purchase of CRC allowances commensurate with their energy use.
- European Energy Star Programme[44] – Voluntary programme to help consumers identify efficient office products

[40] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx
[41] http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm
[42] http://ec.europa.eu/energy/efficiency/labelling/labelling_en.htm
[43] http://www.decc.gov.uk/en/content/cms/emissions/crc_efficiency/crc_efficiency.aspx
[44] http://www.eu-energystar.org/en/index.html

- Enhanced Capital Allowance (ECA) Scheme[45] – allows business to claim enhanced tax allowances on investments in certain energy saving equipment.
- Energy Saving Trust (EST) Recommended Scheme – this scheme offers manufacturers the opportunity to pay to have their energy efficient products accredited with the EST Recommended Label.

A significant proportion of the potential electricity savings presented in the above table are likely to already be captured by these existing policies. Products policy has been successful in removing some of the least efficient products from the market and labelling initiatives are helping buyers to choose more efficient products. However, the full potential for efficiency in this area is yet to be achieved and many organisations still don't consider electrical efficiency when purchasing products. The following policies aim to overcome the above barriers and reduce electricity demand even further:

a) **More labelling for non-domestic products.** A voluntary UK labelling scheme, to address the fact that many non-domestic products are not included in the EU Labelling Framework Directive.

   Labels overcome information issues, and may help organisations facing split incentives make better decisions by drawing attention to the opportunities of more efficient products. The EU Labelling Framework Directive is the primary source of labels for products sold in the UK. Although historically coverage of non-domestic appliances is low, some EU law for non-domestic products is pending. Products policy is an EU competency, so extending labelling unilaterally in the UK would have to be done on a voluntary basis by bilateral agreements, with careful adherence to competition law. It is likely to incur significant costs in testing and benchmarking equipment that may be better shared at an EU level. Consequently this option has been discounted. The Government will continue to push the EU to extend the Directive to more commercial products.

b) **Better labelling for non-domestic products.** Improve mandatory labels so that consumers can easily assess the financial saving associated with buying a more efficient product through whole-life costs (on a voluntary basis given the existing EU Labelling Framework Directive).

   Providing information on the costs saved by efficient equipment is likely to be effective, although the exact nature of information transfer when purchasing non-domestic equipment is not known. This is only likely to be possible on products which have labels in place under the EU Labelling Framework Directive (currently a limited selection in the non-domestic sector). It may also help businesses covered by the CRC to better understand the energy implications of purchasing decisions. The policy helps to overcome information barriers and may help address split incentives within organisations, if it adds more transparency to the decisions being taken and allows the accounting decisions to be expressed more accurately. As this option is potentially simple and inexpensive it is considered further, especially where it might function alongside other policies.

c) **Stricter mandatory standards.** Remove more of the least efficient products from the market by having stricter standards on appliances and products.

   Mandatory standards help address barriers of bounded rationality, information failure and split incentives. The EU Ecodesign Framework Directive currently lays the minimum standards for the efficiency of products sold in the UK and most commercial products are expected to be regulated under the EU Ecodesign Framework Directive in the next couple of years. As a result this option is not considered further, however, the UK continues to push for more, and stricter, standards through the Ecodesign Framework Directive.

d) **Voluntary approach to choice editing via a Buyer's Commitment.** Businesses commit to only buy high-efficiency appliances/electronics in future (e.g. those with an Energy Star

[45] http://etl.decc.gov.uk/

labelling, certain A-G label where relevant, or EST certificate) in exchange for reputational benefit.

If attractive to businesses, this would help overcome split incentives within organisations and bounded rationality, since a decision taken at executive level would be translated into operational guidance for those making purchasing decisions. Success will depend on whether a "critical mass" of support can be built for the scheme - this will depend on the perceived reputational benefit. This merits further testing, including in the consultation document. If popular, this could be an effective way to drive towards the highest-efficiency choices that the Ecodesign Framework Directive doesn't reach.

e) **Targeted financial incentive scheme** via scrappage or voucher incentive for non-domestic products to reward the sale of efficient products.

Delivery through a targeted scrappage or voucher scheme may be more "attention grabbing", and hence more effective at overcoming bounded rationality. The level of support required is untested. There are concerns that if poorly set this could incentivise higher turnover/consumption, incentivising people to buy products unnecessarily. This policy could deliver a lot of the savings that are available in the sector, but there are significant risks of limited additionality, therefore further consideration is needed.

f) **Market-wide financial incentive scheme** - allowing product-related savings to be rewarded and bid into a market wide incentive/obligation.

A market-wide incentive may provide a route by which businesses or aggregators could claim for initiatives which encourage the choice of high-efficiency appliances/electronics by business. A market-wide incentive provides the opportunity for third party groups to overcome other barriers (e.g. using the funding to directly overcome barriers of bounded rationality/information/split incentives within business) and then claim payment.

A reward for purchasing the most efficient appliances could incentivise greater uptake of high efficiency products effectively if the level is set correctly. There is danger that this level would need to be high to affect purchasing decisions for products with high up-front costs but low running costs by virtue of being more efficient. There is also a high risk of subsidising non-additional measures.

Conclusion

The consultation document seeks views on the relevance of better labelling for the non-domestic sector and a voluntary scheme for businesses to commit to buying more efficient products and mechanisms. In addition the consultation document will seek views on whether a financial incentive would be effective in persuading consumers to purchase more efficient products and whether the most effective means of delivering this would be through targeted financing or a market wide scheme.

5. Industrial processes

Industrial processes include a range of products and processes across a heterogeneous industrial sector that could be changed to improve electricity efficiency (this might include some degree of behavioural change). The electricity used by these processes represents one third of total electricity consumption in the UK today. The table below presents estimates of the technical potential savings in 2030 (including potential from existing policies) for industrial processes with the highest potential for savings from the analysis undertaken with McKinsey. These are only initial estimates and should be treated with caution, given the caveats discussed above.

Table 5: Technical potential savings for Industrial processes[46]

Industrial processes	Technical Potential savings

[46] http://www.decc.gov.uk/en/content/cms/consultations/edr_cons/edr_cons.aspx

Run pumps in cascade	6 TWh
Replace motor so they are correctly sized	4 TWh
Replace motors with variable speed drives	2 TWh
Boiler optimisation and other pumps and motors measures	11 TWh
Total	**23 TWh**

The following key barriers and market failures for this sector have been identified (listed in priority order):

- **Risk aversion and uncertainty.** The benefits of efficiency are outweighed by the risk associated with changing industrial components
- **Hurdle rate/payback.** Businesses won't consider investments with a payback period longer than 2-3 years, valuing short-term investments more than long-term. However electricity efficiency measures have a payback of around five years on average
- **Bounded rationality.** Businesses reduce complexity by taking only a few key factors into account when making decisions
- **Capital constraints.** Limits to the availability of capital impede investment
- **Product availability.** Electricity efficiency products are not widely available to users
- **Split incentives** between parties
- **Transaction barriers.** For example the hidden costs of the investment or time to implement a new measure
- **Imperfect information.** Businesses don't know what measures are available and it can be costly to find out
- **Installation and use.** Improperly installed and/or operated equipment does not realise total potential savings.

To attempt to overcome the above barriers and seek to drive the potential electricity savings the following policy options are considered:

Existing policies (Do nothing) – there are a range of existing policies in this sector, which include;

- Enhanced Capital Allowances – Allows businesses to claim 100% of tax relief if they choose plant equipment from an approved list of energy efficient equipment.
- EU ETS[47] – Europe-wide cap and trade system that sets an overall cap on the total emissions allowed from all the installations covered by the System but allows trading of allowances so that the carbon price is determined by the market and emissions can be reduced at lowest cost. It covers emissions from industrial processes and large combustion plants. The EU ETS emissions savings are in the baseline for analysis, therefore all suggested savings are additional to the impact from this policy
- Climate Change Agreements – Provides 54 energy intensive industries with a discount from CCL (currently 65%, rising to 90% for electricity in 2013) in return for meeting energy efficiency or emission reduction targets.
- Ecodesign Framework Directive[48] which includes requirements for motors although very few are relevant to industrial processes.
- CRC Energy Efficiency scheme – Incentivises energy efficiency improvements in large non-energy intensive organisations in the public and private sectors by mandatory

[47] http://www.decc.gov.uk/en/content/cms/emissions/eu_ets/eu_ets.aspx
[48] http://ec.europa.eu/enterprise/policies/sustainable-business/documents/eco-design/legislation/index_en.htm

reporting of energy consumption and the purchase of CRC allowances commensurate with their energy use.

- Energy Efficiency Audits – A requirement that all businesses have expertly conducted periodic audits of the energy performance, and efficiency opportunities, of both buildings and processes. This will be a future required under the EU Energy Efficiency Directive of which there is a forthcoming consultation.

As a consequence of these existing policies a large proportion of the technical electricity savings presented in the above table are likely to already be captured. Reviewing existing policies, analysis undertaken with McKinsey has found that although there are policy measures in place such as Climate Change Agreements which encourage energy efficiency at sectoral level, there are no policies that target specific processes or systems. In particular, analysis undertaken with McKinsey identified a total of 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 around 24 TWh, of which only around 5% is expected to be captured through current and planned policies. 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[49]. Approaches that encourage a whole system approach therefore have the potential to more successfully realise these benefits than a product-only approach. The following policies aim to overcome the above barriers and further reduce electricity demand:

a) **Information hub.** A repository of information on industrial process efficiency which could be web-based, including case studies of past successes.

   An information hub may overcome some barriers around information/trust (which is not one of the most significant barriers in the sector), but would only appeal to those seeking information and consequently would be less effective at tackling bounded rationality and making efficiency 'front of mind'. It is difficult to identify how the additional information drives demand reduction, but the project risks are likely to be low, including legal, competition, gaming and accounting risks. However, before considering whether further intervention is necessary, the Government is keen to understand whether there are currently gaps in knowledge which need to be addressed and whether Government has a role in addressing these. This option is considered further, and the consultation is seeking evidence on the relevance and need for such a policy.

b) **Voluntary Disaggregated metering (sub-metering).** Detailed information on how much electricity is consumed by individual processes (such meter would not be used for billing purposes).

   This could potentially help businesses overcome information failures with a better understanding of the energy used by different industrial processes (some businesses report difficulty in being able to measure energy use by individual elements of the production line/site). Whether the information provided by this would be useful in addition to mandatory audits merits further consideration once mandatory audit design is finalised. The consultation document seeks views on the usefulness of disaggregated metering on providing more information on the electricity use of individual industrial processes.

c) **Mandatory standards for industrial processes.** Industrial energy users are required to meet minimum standards for their processes (potentially linked to mandatory audits).

   As in other sectors, mandatory standards (subject to compliance) are expected to be the most effective way of overcoming risk aversion/uncertainty, bounded rationality and information by forcing action. However, this would be very difficult and expensive to implement in practice as there are no benchmarks against which standards can be set for the diverse range of industrial processes and there is potential overlap with existing policy.

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

Additionally there could be competition risks and the creation of perverse incentives to focus on parts of system captured by policy. Therefore this option has been discounted.

d) **A new scheme providing loans for industrial efficiency projects.**

This scheme would be expected to help overcome access to capital barriers; although there is currently no specific evidence as to whether the issue around access to capital is one of supply or demand for capital. The Green Investment Bank has identified non-domestic efficiency (including industrial projects) as a priority, and there are a number of Government schemes in place to help businesses, therefore the space for additional policy is considered to be very limited and this option is discounted.

e) **Targeted financial incentive through scrappage scheme.** Developers receive a lump sum for replacing old/inefficient equipment.

Motors, pumps, air-compressed systems and furnaces account for a significant proportion of electricity used in industry. A scrappage scheme for industrial components could help overcome risk aversion and uncertainty, hurdle rate/payback and bounded rationality. Slow turnover of these components due to their long life-cycle means a scrappage scheme is likely to drive additional action rather than simply paying for interventions that would have happened anyway. There is a risk that a scrappage scheme may just result in the replacement of products with more efficient versions of the same product without consideration of whether further efficiency gains could be made by considering the size of the pump or how the system is configured. The rate at which payment would need to be provided is also unknown. Thought would need to be given to how to reduce deadweight costs (although these would be less significant compared to the boiler scrappage scheme in the domestic sector due to the longer life-cycle of products). The scheme could be quite effective in addressing all the barriers in the sector however could be less effective in managing risks, such as accounting risks and gaming and could be quite expensive.

f) **Market-wide financial incentive scheme.** Allowing electricity savings from industrial products to be rewarded and bid into a market wide incentive/obligation.

A market-wide incentive/obligation would allow industrial developers to receive support for efficiency projects. The scheme is likely to be highly flexible (as technologies change) and should encourage developers to take a system optimisation approach, rather than focusing on individual components. If designed well, this should address barriers of risk aversion and uncertainty, hurdle rate/payback, lack of focus, capital constraints and possibly transaction barriers - although calculating the level of support that would be required for any of these would be very difficult.

Conclusions

The consultation document seeks views on an information hub with case studies and product information for industrial users seeking more information on energy efficiency and the level of interest in disaggregated metering. Additionally the consultation document will seek to investigate the extent to which a financial incentive is believed to overcome the barriers that exist in this sector. The consultation document will question the suitability of such a financial incentive for this sector and consider whether a market-wide scheme or targeted financial incentive is appropriate.

Market wide schemes

Across the sectors the option of a market wide scheme has been discussed. This section aims to give more detail of the potential mechanisms by which a market wide scheme could be delivered. These mechanisms could also include elements of a number of the targeted financial incentive schemes. As mentioned at the start of the policy options section there are three main mechanisms for a market wide scheme. These are discussed below:

Premium Payment[50] for electricity efficiency.

This would provide participants with a payment on top of the savings that result from reduced use of electricity. This could be either through a single premium payment (an agreed flat fee for every kWh saved) or a premium payment with contract for difference (CfD) (a payment to top up the electricity price to an agreed level (strike price) for every kWh saved). The simple premium payment is likely to be more straight-forward for customers to engage with but the CfD may provide better value for money (as it should be simpler to set the price and should limit support payable especially with rising electricity prices). The price per kWh reduction received would be determined by auctions, and there would be a role for a scheme operator in verifying measures and ensuring additionality against Government-set criteria. There remain a number of other detailed decisions that would need to be resolved if this approach was taken forward.

Capacity Market – participation of electricity efficiency in the proposed GB Capacity Market

The Government is taking powers to introduce a Capacity Market, if required under Electricity Market Reform[51] 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. The Government is taking powers to introduce a Capacity Market, if required, under Electricity Market Reform[52]. 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.

The Capacity Market is currently planned to allow capacity to be provided by generation, demand side response (DSR) [53] 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.

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.

[50] 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 over a longer term,

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

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

[53] 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.

Energy Supplier Obligation for electricity efficiency

Learning from international examples and current schemes for the domestic sector in the UK (CERT and ECO) an additional obligation could in principle be placed on energy suppliers to deliver a specific target or quantity of electricity demand reduction for non-domestic customers. Suppliers could fulfil their obligation by working directly with customers, through a third party or aggregator directly, or running auctions for third parties to bid savings into. An independent central body would be put in place to verify allowable measures in line with the scheme's set 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. Traded certificates are likely to be more appropriate with many players across sectors and the trading mechanism could help to minimise costs. Whilst this option has been discounted for domestic customers this will be considered as one of the ways in which a market wide financial incentive could be delivered. There remain a number of other detailed decisions that would need to be resolved if this approach was taken forward.

Evaluation of market wide options

There are a number of similarities between the different market wide mechanisms and there will be challenges around the design of each of them. The measurement, verification and additionality difficulties are likely to be similar between the three and will be important in ensuring energy security. There will need to be careful consideration of how the schemes fit with other policies to avoid rewarding participants twice for the same activity. These include the CRC Energy Efficiency Scheme, Climate Change Agreements, ECO and also schemes requiring minimum standards. All three schemes should all fit well with the mandatory audits that are being introduced in 2014 in line with the requirement in the EU Energy Efficiency Directive.

There are also differences that will help determine between the mechanisms. The differing levels of complexity of the different schemes may also affect uptake, with a CfD potentially adding an additional level of complexity.

There are quite a few similarities between the premium payment and supplier obligation. One area where they differ is the early clarity over the price of payments under the premium payment, which may be more attractive to some participants than the supplier obligation where the price to be received for certificates may not be known until they are sold. Conversely the supplier obligation offers clarity on the quantity of the savings that will be achieved and (if designed appropriately) could minimise economic cost and any rent for demand reduction and potentially have a better distributional impact. Competition to deliver outcomes will have an impact on the risks associated with the different schemes. Competition to deliver a quantity of energy saving will tend to drive down costs, whilst competition to deliver energy saving at a fixed price will tend to drive up the quantity of electricity saving. Therefore a quantity based scheme (such as an obligation) may be lower risk than a price instrument. However, further investigation and evidence gathering of the risks associated with all three schemes will be undertaken.

The different operators of the two schemes may also have implications for their attractiveness, with some participants preferring to engage with a scheme run by their supplier and others by an independent organisation. While suppliers are established in running similar schemes in the domestic sector there might be sufficient differences between domestic and non-domestic sectors for there not to be straight read across.

The scope of each of the mechanisms could be determined by setting either or both of cost and capacity restrictions. Setting a cost envelope helps manage the impact on consumer bills by setting a limit on the total amount that can be levied and cost effectiveness can be achieved by

allocating funding for projects through competitive price auctions. Setting a capacity envelope may serve to drive down the costs of measures if set at the right level by resulting in competition for measures at the lowest cost but may conversely result in very expensive measures being implemented if the target is set too high and there is not a restriction on overall costs.

Further investigation of all market wide options is needed. Therefore the consultation will seek additional evidence and views for all three schemes.

Proportionality

This is an initial IA and therefore more detailed quantitative analysis is not included. However, this IA has aimed to reduce the number of potential policy options under consideration. Future IAs will focus on individual policy options, taking on board consultation responses and a range of evidence and analysis to produce detailed quantitative assessments and comparisons to influence and guide policy development.

Risks and assumptions

As this IA is high level and takes a qualitative approach to the assessment of policy options the risks and assumptions are minimal. However, as the assessment is qualitative it is open to issues of inconsistency and personal interpretation. The main risks are around the potential additionality or overlap between policies and potential deadweight loss of individual policies that are difficult to assess. As there are a significant number of existing policies across all sectors defining and quantifying the baseline is very difficult and will prove one of the key risks in future analysis.

Wider impacts

As this is an initial IA only a high level assessment of the potential wider impacts has been be considered, with the expectation that further policy development will include a more detailed assessment for each individual policy. The discussions below offers a high level assessment of the potential impact of the whole of the EDR scheme but also attempts to consider the range of policies organised into the following groups for further investigation (if necessary):

- Information schemes and voluntary approaches
- Loan schemes
- Mandatory standards
- Subsidies – including both targeted financial incentives and market wide incentive/obligation schemes.

Distributional analysis

The distributional impact varies by policy option, in particular depending on how the measures to improve electrical efficiency are funded.

The vast majority of the benefits associated with electricity demand reduction accrue to the individuals or firms who have installed the measures, in the form of reduced electricity bills. There are other sources of benefit which are experienced by everyone, but these are likely to be considerably smaller in magnitude:

- External benefits – including reducing exposure to security of supply risks, improving air quality, and stimulating ‘green growth’
- Wholesale price effect – if the demand reduction leads to a reduction in the wholesale price of electricity through a downward shift in the costs of the marginal, price-setting plant, then there may be a reduction in the cost of each unit of electricity sold within the market

- Support cost effect – if the demand reduction policy does result in a reduction in the size of subsidies paid to the electricity sector, this should lead to a commensurate reduction in bills given the way in which energy subsidies are levied (i.e. through consumer bills).

The costs of installing the electricity efficiency measures fall to different parties under different policy options.

Self-funded options
For options such as mandatory standards or labelling initiatives which lead to customer making more efficient purchasing decisions, the user of the equipment will pay for this equipment. As they will also receive the majority of the benefits associated with the installation, there are limited distributional consequences.

Options funded by financial incentive
The source of financing will result in different distributional impacts, depending on how and from whom the financing is collected. This will be investigated fully as policy options are developed further.

Competition assessment

EDR policies have the potential to impact a very wide range of markets in the UK, with policies focussed on the domestic, commercial, industrial and potentially the public sector as well as the market for electricity efficiency products and aggregators. In addition depending on the intervention there could be an impact on the financial sector, electricity suppliers and electricity generators. Consequently all policy options will have to include careful consideration of the potential competition impacts both for markets where the intervention is aimed at, possible providers and markets where the funding is gained.

Information schemes and voluntary approaches are likely to have a minimal impact on competition. They should be a minimal direct or indirect limit on the number or range of suppliers, limit the ability of suppliers to compete or reduce incentives to compete. However, small firms may find it relatively more expensive to participate in schemes than larger competitors with lower marginal costs. Also companies that currently work with organisations to provide information as a wider support to help improve efficiency may be impacted.

Loan schemes are unlikely to limit the number of suppliers either directly on the supply of products, or limit the ability of suppliers to compete or reduce incentives to compete. However, a loan scheme would have an impact on the wider financial market and the impact on competition would need to be carefully considered.

Mandatory standards may add costs for industrial businesses that their international competitors do not face. However, it should not impact the incentive to compete.

The competition impact of subsidies will depend on a range of issues; which sector they are applied to, how they are funded, and whether they are direct or market wide. Further consideration of the competition impact will have to be applied whist considering the range of policy options and variations. However at this initial stage it can be stated that financial incentives are unlikely to directly impact the number or range of suppliers, but could have an indirect impact depending on the funding mechanism. Again depending on the funding and delivery mechanism it could limit the ability for suppliers to compete and reduce their incentives to compete vigorously.

Small firm impact

As the policies discussed above aim to reduce electricity demand across all sectors it is inevitable that small businesses will be affected. However, how and to what extent they are affected will depend on the policy and the funding mechanism. Information and voluntary schemes should have a minimal cost impact and the benefits of involvement should outweigh

the costs. Mandatory standards and subsidies will have a greater impact on businesses with cost likely to fall disproportionately on small firms (a higher proportion of their revenue will be needed to act and make changes).

As the policy options are developed there will need to be consideration of possible alternative approaches (including exemptions, simplified inspections, less frequent reporting), which might be appropriate for firms with fewer than 20 employees. Additionally it will be necessary to:

- Scope issues with a representative sample of small businesses
- Determine if there will be a greater impact on operations and performance of smaller firms
- Gather data on the likely impacts on small firms as part of the consultation including costings

Wider Environmental impact

The EDR polices are considered against the following questions for environmental impacts:

1. Will the policy option be vulnerable to the predicted effects of climate change?

No

2. Will the policy option lead to a change in the financial costs or the environmental and health impacts of waste management?

By potentially incentivising the early retirement of existing products or appliances (through mandates and financial incentives) there could be an increased amount of waste.

3. Will the policy option impact significantly on air quality?

There could be a marginal improvement in air quality if demand reduction results in a reduction in the use of fossil fuels (specifically coal) for electricity generation.

4. Will the policy option involve any material change to the appearance of the landscape or townscape?

This will depend on the building measures, for example external solid wall insulation may change the appearance of buildings (this could be an improvement).

5. Will the proposal change 1) the degree of water pollution, 2) levels of abstraction of water or 3) exposure to flood risk?

Unlikely

6. Will the policy option change 1) the amount or variety of living species, 2) the amount, variety or quality of ecosystems?

Unlikely

7. Will the policy option affect the number of people exposed to noise or the levels to which they're exposed?

Building materials which aim to improve efficiency, such as insulation or double glazing, also help to reduce exposure to noise.

Greenhouse Gas impact

The electricity retail price already includes the pricing of carbon through the EU ETS price. Therefore there is likely to be no impact on the level of carbon, but EDR will help to reduce the total cost of cutting carbon emissions in the UK (as well as potentially having a marginal impact on the EU ETS price).

Health impact assessment

There is no reason why any EDR policies would have an impact on health as all the products that could be applied are already in existence. The potential health impacts have been considered against the health impact screening questions[54]:

1) Policies that impact the domestic sector might have an impact on human health mainly through the installation of insulation in electrically heated homes (which evidence suggests should typically reduce the exposure to factors which can lead to risk of cold and indoor air quality-related illnesses). Depending on the funding scheme for the different policies there could be an indirect impact on disposable income if consumer bills increase, therefore potentially increasing the trade-off between warmth and other essentials for some lower income households.
2) The policies are unlikely to have any impact on lifestyle related variables, such as physical activity, alcohol use or sexual behaviour. However, findings have suggested that a warmer household could reduce the risk of mortality, morbidity and stress within the home[55], findings do not exist for the working environment.
3) As these policies are focussed on electricity demand reduction, but without impacting consumer utility, there should not be an impact on the demand for health and social care services.

Human rights assessment

These policies should not have an impact on human rights especially as they aim to reduce electricity demand without affecting consumer utility.

Justice impact test

Mandatory standards may have an impact on the justice system if it is necessary to create fixed penalties or sanctions to enforce these mandates with organisations or individuals. Additionally delivery through a supplier obligation would need fixed penalties or sanctions (although existing legislation could be used). If companies or individuals dispute mandates or obligations this will increase business for the courts and tribunals.

There should not be a justice impact for information schemes and voluntary approaches, loans or financial incentives, but this will be contingent to their funding stream.

Rural proofing impact

The majority of these policies are likely to be focussed on non-domestic and industrial organisations which are more likely to be found outside of rural areas. Therefore rural areas are less likely to benefit from these measures. Policies for the domestic products and appliances should be shared equally across all households irrespective of their location. Domestic building products will be focussed on homes which are electrically heated; these will be homes that are off the gas grid. According to the 2010 English housing survey 21% of electrically heated homes are found in rural locations, whilst only 19% of all households are in rural locations. Therefore there is a marginal rural bias for action to help electrically heated homes. It should be noted that only 10% of rural properties are electrically heated so only a tenth of rural homes could benefit.

Additionally the rural impact should be taken into consideration when considering the funding mechanism as average energy consumption or income may differ for rural areas from the national average.

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54 http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Publicationsandstatistics/Legislation/Healthassessment/DH_4093617

55 http://www.apho.org.uk/resource/item.aspx?RID=53281

Equalities impact assessment

The policies discussed are likely to have considerable impact across society, although the scale of this impact will vary and as a result there could be equality issues. The equality issues will differ depending on the policy option under consideration and the funding stream to pay for the options. However, it is unlikely that policies will treat different protected groups differently or impact areas of known inequalities (for example, access to public transport for disabled people, racist/homophobic bullying in schools).

Sustainable development impact

Intergenerational impacts – costs for policies are likely to be met by the current generation, whilst the long-run benefits associated with lower electricity demand may benefit future generations, through lower electricity prices.

As this is only an initial IA with limited cost benefit analysis it is not currently possible to provide more detailed sustainable development evaluation. This will be completed as individual policies are developed.

One in one out (OIOO) – impact on business

The different policy options will have different impacts on business with voluntary and information schemes and loan schemes having a minimal direct impact. Subsidies are unlikely to have a direct impact on business, but may have an indirect impact depending on the funding mechanism.

However, mandatory standards policies will directly impact businesses either as the organisation having to influence others or the individual firm having to make changes. The scale of the impact on business will have to be determined if policies such as mandatory standards are developed.

Annex A: Internal modelling of EDR impact on system costs

The benefits of reducing demand have been estimated using DECC's Dynamic Dispatch model (DDM). The DDM is a comprehensive fully integrated power market model covering the GB power market over the medium to long term. The model enables analysis of electricity dispatch from GB power generators and investment decisions in generating capacity from 2010 through to 2050. It considers electricity demand and supply on a half hourly basis for sample days. Investment decisions are based on projected revenue and cash flows allowing for policy impacts and changes in the generation mix. The full lifecycle of power generation plant is modelled, from planning through to decommissioning, and also allows for risk and uncertainty involved in investment decisions[56].

The analysis uses DDM runs from summer 2012 using central assumptions for all supply-side variables[57] that were valid at the time, applying three scenarios for lower demand. The baseline in this impact assessment is therefore not completely consistent with the latest published Updated Energy and Emission Projections (published in October 2012). The scenarios are purely illustrative and were chosen to investigate the potential cost savings associated with demand reduction policies. No assumption about which policies would be used to achieve such savings has been made.

Table 6: Electricity demand reduction scenarios considered in the DDM

Scenario	Reduction from Baseline in 2020	Reduction from Baseline in 2030
Scenario 4	2%	4%
Scenario 10	5%	10%
Scenario 20	10%	20%

Key results and conclusions of this analysis were:

- Reducing demand by each additional 1% (i.e. 4 TWh) in 2030 reduces electricity generation costs over the period 2010-2030 by around £2bn[58]. This result is fairly consistent across the three scenarios, but it is not appropriate to focus on one specific model run due to the 'lumpiness' of electricity generation investments
- This translates to a whole systems cost saving in the region of £100[59] per MWh of demand reduction plus up to £8/ MWh in savings in the transmission and distribution networks[60] (not calculated through the DDM), giving an overall saving in the region of £105/ MWh
- In all three scenarios, less new gas plant capacity is built (CCGT, gas CCS). From Scenario10, there is also a reduction in on- and offshore wind capacity. Nuclear new-build is only reduced in Scenario20
- The DDM's projected capacity mix in 2030, and the pattern of capacity displaced by demand reduction in the modelling work, is crucially dependent on the conditions imposed within the model: the requirement to meet the 2020 renewables electricity ambition and to achieve 100gCO_2/ kWh of generation in 2030. These conditions drive

[56] The modelling assumes that: 1) the capacity margin has to stay above 10%; 2) the 2020 large scale renewable electricity ambition has to be met and 3) the electricity sector has to achieve a carbon intensity of 100g/ kWh by 2030 (a pure modelling assumption that does not represent Government policy)

[57] This includes central estimates for electricity prices, carbon prices and demand projections for counterfactual demand. See the updated energy projects and interdepartmental analysis group guidance for more detail on the assumptions; http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/en_emis_projs/en_emis_projs.aspx and http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx

[58] NPV over period 2010 to 2030 discounted at social discount rate of 3.5% and reported in 2010 prices. Demand falls on a trajectory from 2012 to 2030, delivering the stated total saving in 2030.

[59] All monetary figures presented in the annex are in 2010 prices

[60] The figure would be higher under current IAG guidelines. These are however under review and a lower figure is used here for illustrative purposes.

the need to install low carbon capacity and because these requirements remain in the context of EDR, the quantity of low carbon capacity which can be displaced by demand reduction is relatively small. Relaxation of the assumed 100g decarbonisation ambition will be considered in the next phase of this project.

Additional runs of the DDM have been used to investigate the importance of the time of day at which demand is avoided in driving the value of the levelised benefit of demand reduction. This is important in understanding whether all the electricity demand reduction policy options would lead to similar financial benefits. These included runs where the demand reduction was modelled using only a reduction in domestic/ non-domestic load profiles (to approximate an EDR policy focused on the domestic/ non-domestic sector), and a run where only overnight demand was reduced (to consider whether the benefits of demand reduction would be maintained if the only measures incentivised were about reducing overnight wastage e.g. through turning off office lights).

The conclusion was that the financial value of demand reduction is broadly equivalent across the different scenarios. The value of electricity demand reduction overnight was around 20% lower than during the day, which is probably not large enough to require that time of day issues need to be incorporated within policy design. However, none of the scenarios considered demand reduction at times of system peak only; the financial value of reducing demand at the peak specifically would be expected to be higher than the benefits of reducing demand across the day as a whole. Hence the results of this modelling work do not affect conclusions reached in other work that Demand Side Response can move demand from periods of higher prices to periods of lower prices, therefore improving the efficiency of the system[61].

Annex B: Support cost detail

If a financial incentive were to be used to encourage demand reduction, for EDR to result in lower total support cost it would be necessary for agents to be willing to introduce measures to save electricity for a financial support no greater than the value of support otherwise provided for the generation of this displaced unit of electricity. Given the assumptions underlying the model, the modelling values this at between £4 and £11/ MWh, reflecting the fact that only a share of generation capacity displaced by an EDR measure will have been supported. It is necessary to consider whether this value of support would represent a sufficient financial incentive to drive additional take-up of energy efficiency opportunities.

However, there are two reasons why we may value 1 MWh of demand reduction less than 1 MWh of generation delivered:

1. Additionality issues – the degree of 'additionality' is likely to be lower in demand reduction measures, as compared to low carbon generation, as more of these projects would have happened anyway and so become absorbed into BAU. On this basis, it may only be appropriate to reward a portion of the technically achievable electricity savings resulting from a measure
2. Innovation benefits – there are innovation benefits in both the low carbon supply and demand reduction spheres resulting from the deployment of new technologies.

Given these additionality and innovation issues, if we are paying an average of £6 or £7/ MWh in subsidies towards low carbon generation, we may instead be willing to support demand reduction measures with a payment of say £4/ MWh.

In addition, the lifetime over which this payment should be made will be different for a demand reduction technology. Even though a technology may have a lifetime of say 10 years, there are risks that the firm will close or refurbish their premises before the measure has reached the end of its life. So it is likely that on the demand side payments would only be made for a limited

[61] For more information on the potential benefits from demand side response see: http://www.decc.gov.uk/en/content/cms/meeting_energy/network/strategy/strategy.aspx

duration, which may vary by measure. Whether this payment would be sufficient to generate take-up of new EDR measures is crucial in determining whether it would be possible to reduce the total magnitude of subsidies paid to low carbon generation and demand reduction.

The key financial reward for undertaking demand reduction measures is the reduction in electricity bills which results. At a per unit cost of 12p/ kWh, this is equivalent to £120/ MWh. In this context, a payment of the magnitude discussed is relatively small. This is most likely to be effective in generating substantial additional take-up of efficiency measures if policy design addresses barriers such as lack of focus directly through awareness and profile-raising. Overall, therefore, there may not be substantial support cost impacts resulting from a financial incentive policy.

For non-financial measures, such as standards or labelling initiatives, there could be a reduction in the overall size of the support pot if demand were successfully reduced. With a lower level of demand, the amount of low carbon generation required would be reduced and so the amount of support paid to bring forward such generation could also be reduced. However, the discussion above demonstrates that this saving would be limited in magnitude: if wider decarbonisation goals are to be met, it is not possible to trade off a unit of demand reduction one-for-one with a unit of low carbon supply.

Annex C: Qualitative methodology

The above options have all been considered using a qualitative analytical approach which aims to assess the policy options against the policy objectives and aims. The policy objectives have been further broken down into the following criteria to assess the options against. These criteria include consideration of each of the six generic critical success factors (Strategic fit, Value for Money/benefits optimisation, potential achievability/risk profile; Potential affordability/cost; Supply side capacity and capability; Alignment with the regulatory agenda). To reflect the importance of the different policy objectives the scoring process weighted the criteria. As part of this weighting all the criteria within the 'will policy successfully drive electricity demand' were considered equally against the other policy objectives. Within the other three objectives a total score (out of 10) was achieved by weighting the sub criteria. These weightings are included in brackets for each criterion.

1. Will the policy successfully drive electricity demand reduction?

1.1 Does the policy target the right barriers and areas of technical potential in each sector?

1.2 How feasible will it be to measure and verify the electricity savings from this policy? What would be the mechanism for this? How certain could we be of these electricity savings in practice?

1.3 Is there a reason to believe that this policy approach will deliver fewer benefits than other policies because of higher risks of non-additionality (deadweight)?

1.4 Is the policy flexible as the technical potential/barriers/technologies in this area change through time?

2. Is the policy deliverable on the ground? Is it politically and publically acceptable?

2.1 Can it be piloted to test uncertainties and cost? (3.3)

2.2 Will the policy motivate project developers and be taken up / implemented in practice? Does the policy fit with existing policy (both "on the ground" and in its policy approach?) (3.3)

2.3 Is it likely to face significant opposition? By whom, and why? (3.3)

3. Is the policy likely to be low cost and/or easy to deliver?

3.1 Is the policy complex and expensive to implement? Is the architecture likely to incur greater costs than other policy approaches? (6)

3.2 Are the costs associated with ensuring compliance, or measuring and verifying savings and additionality likely to be particularly extensive? (4)

4. Does the policy manage the project risks adequately?

4.1 Legal risks. Is the policy likely to be compliant with State Aid? Are there other Legal risks that may be unmanageable? (1)

4.2 Complexity/delivery risks. Is the policy likely to be too complex to deliver in practice? (2)

4.3 Competition risks: Does the policy risk restricting competition within the energy efficiency industry? (1)

4.4 Perverse incentives and outcomes: Does the policy risk creating perverse incentives (particularly for wider energy efficiency) or generating other unintended consequences? (2)

4.5 Accounting risks: does the policy pose any risks to public accounting that should be considered? (1)

4.6 Gaming or fraud risks: Does the policy incur high risks of fraudulent behaviour, and can these risks be managed? Could the policy be “gamed”? How? (2)

4.7 Distributional risks: Does the policy incur significant risk of unequal distribution of costs and benefits? (1)

The table below presents the final qualitative assessment of the options considered. In general any option that has a cross for any of the criteria (other than the level of EDR reduction column) is not considered for further investigation.

Summary of the qualitative assessment of the different policy options

	Will the policy drive demand reduction?								
	Does the policy target the right barriers and areas of technical potential?	Ease of Measuring and verification of EDR	Does it avoid higher risks of non-additionality (deadweight)?	Is the policy flexible?	Is the policy deliverable on the ground?	Is the policy likely to be low cost and/or easy to deliver?	Does the policy manage the project risks adequately?	Does the policy drive high levels of EDR?	Considered in the Consultation?
Domestic buildings									
Information schemes	4	n/a	0	7	8	8	7	0	no
Mandatory standards	3	6	1	8	5	4	6	2	no
Targeted obligation via ECO	5	9	3	5	5	5	5	1	no
Market-wide scheme	7	6	5	7	7	6	4	4	yes
Non domestic buildings									
Mandatory audits - being delivered by the EED	3	6	0	8	5	4	6	1	no
loans scheme - being delivered by the GIB	4	7	0	8	7	6	5	1	no
Standards - higher standards in PRS	9	n/a	1	n/a	5	7	8	1	no
Targeted finance scheme	7	7	6	4	8	6	5	4	yes
Market-wide scheme	7	8	7	9	6	4	4	6	yes
Domestic products									
Labelling with £ value (voluntary)	8	5	8	10	9	8	8	2	yes
Mandatory standards	3	n/a	0	6	5	4	6	2	no
Financial incentive via domestic obligation (voluntary)	8	8	1	3	7	2	4	3	no
Financial incentive via scrappage scheme	6	2	2	3	4	6	2	3	no
Targeted voucher scheme	8	7	5	4	7	4	3	3	yes
Market-wide scheme (voucher)	8	7	5	4	7	4	5	4	yes
Non domestic products									
Labelling extension	3	3	8	7	7	8	7	1	no
Labelling improvement	4	5	8	7	7	9	7	1	yes
Voluntary agreement with purchasers	6	5	7	8	8	8	7	1	yes
Mandatory standards	3	n/a	0	6	5	4	6	1	no
Targeted incentive via scrappage scheme	5	8	4	5	6	4	5	2	yes
Market wide scheme	4	5	6	8	6	5	5	3	yes
Industrial processes									
Information hub	4	n/a	7	9	7	6	7	4	yes
Disaggregated metering	4	n/a	8	7	8	7	8	4	yes
Mandatory standards	9	6	2	2	4	3	4	7	no
Loan scheme	3	7	1	8	7	6	5	4	no
Scrappage scheme	5	7	5	4	6	6	5	5	yes
Tax incentive	4	6	2	1	3	9	6	5	no
Market-wide scheme	8	7	7	9	6	4	4	5	yes
Market wide schemes									
Feed in Tariff	7	2	3	4	6	3	4		
Capacity Market	7	1	1	2	3	3	4		
Supplier Obligation	7	3	3	4	6	3	5		