Summary: Intervention & Options

Department /Agency:	Title:	
DECC	Delivery Mechanisms for Supplier Obligation	
Stage: Consultation	**Version: 2**	**Date: 10th February 2009**
Related Publications: Summary for HES Consultation Impact Assessments, IA Financial Measures, District Heating: Economic Assessment and Evaluation of Evidence		

Available to view or download at:

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

The government has committed to reducing greenhouse gas emissions by 80% by 2050. In order to achieve this, households need to take up a range of energy efficiency measures to reduce demand for both electricity and gas. There are however a number of barriers to energy efficiency in the domestic sector ranging from the up-front cost of measures to the hassle involved in installing measures. The current CERT programme is a government intervention designed to overcome these barriers by requiring energy supply companies to install measures, however in the future different delivery agents and mechanisms could be used.

What are the policy objectives and the intended effects?

The main objective of the delivery mechanisms is to overcome barriers to the uptake of energy saving measures to reduce energy consumption and greenhouse gas emissions from the domestic sector. Alternative delivery options to the supplier obligation would ensure measures are installed in a cost effective and fair way, e.g. by taking advantage of the opportunity for integrating energy provision to multiple dwellings (e.g. through Whole House approach, CHP, or District Heating), and by focusing measures to redress adverse distributional impacts.

What policy options have been considered? Please justify any preferred option.

a) Do nothing

b) Outcome based policy: SO targeting a cap either on energy sales or on notional carbon emissions (not linked to the EU ETS)

c) Measures based policy: SO targeting a level of installations

d) A combination of both policies: SO targeting measures as well as outcomes

e) Delivery by Central Coordinating Body

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

Review dates to correspond with carbon budget calendar.

Ministerial Sign-off For consultation stage Impact Assessments:

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:

Signed by the Secretary of State on 10th February 2009:

Summary: Analysis & Evidence

Policy Option: Supplier Obligation – Outcome Based	Description: A cap on supply companies to limit carbon emissions associated with household energy use

COSTS

ANNUAL COSTS	
One-off (Transition)	**Yrs**
£	9
Average Annual Cost (excluding one-off)	
£ TBD	

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

The cost to energy companies of purchasing allowances would be £41bn although this would be a transfer to central government and therefore not attributable to PV costs.

Total Cost (PV) **£ TBD**

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

Loss of consumer and producer surplus from higher energy prices that reflect the cost of allowances.

BENEFITS

ANNUAL BENEFITS	
One-off	**Yrs**
£	9
Average Annual Benefit (excluding one-off)	
£ 1.4	

Description and scale of **key monetised benefits** by 'main affected groups' Benefits of reduced energy demand will be £5.2 bn, the benefits of reduced purchases of EU allowances would be £0.5 bn and the benefits of reduced carbon emissions would be £1.2 bn. The benefits of avoided renewable would be £4.1 bn.

Total Benefit (PV) **£ 10.9**

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

Key Assumptions/Sensitivities/Risks

Results are sensitive to assumptions around domestic consumer price elasticities.

Price Base Year 2008	Time Period Years	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate) **£ TBD**

What is the geographic coverage of the policy/option?			GB	
On what date will the policy be implemented?			2011	
Which organisation(s) will enforce the policy?			New authority	
What is the total annual cost of enforcement for these organisations?			unknown	
Does enforcement comply with Hampton principles?			yes	
Will implementation go beyond minimum EU requirements?			no	
What is the value of the proposed offsetting measure per year?			unknown	
What is the value of changes in greenhouse gas emissions?			£1.1 bn	
Will the proposal have a significant impact on competition?			yes	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes	Yes	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ tbd Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Summary: Analysis & Evidence

Policy Option:	Description:
Supplier Obligation – Input based	**An obligation on suppliers to install energy saving measures in domestic dwellings**

COSTS

ANNUAL COSTS	
One-off (Transition)	**Yrs**
£	9
Average Annual Cost (excluding one-off)	
£ 2.2 bn	

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

Costs accrue from the purchase of energy efficiency measures and some administration costs.

Total Cost (PV) **£ 15.9bn**

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

BENEFITS

ANNUAL BENEFITS	
One-off	**Yrs**
£	49
Average Annual Benefit (excluding one-off)	
£ 1.8bn	

Description and scale of **key monetised benefits** by 'main affected groups' Benefits accrue from increased comfort to Uk householders £3,741m, reduced energy consumption £17,870m, reduced purchases of EU allowances (for reduced electricity consumption) £2,257m and reduced emissions of carbon dioxide from non-traded sector £4,823m. There are also benefits from avoided expenditure on renewables which equate to £12,162m.

Total Benefit (PV) **£ 40.9 bn**

Other **key non-monetised benefits** by 'main affected groups' The main assumption and sensitivity is around the extent to which supply companies will have to subsidise measures. This cost benefit analysis assumes suppliers will have to subsidise 50% of low cost measures rising to 75% of higher cost measures

Key Assumptions/Sensitivities/Risks

Price Base Year 2008	Time Period Years	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate)
			£ 25bn

What is the geographic coverage of the policy/option?			GB	
On what date will the policy be implemented?			2011	
Which organisation(s) will enforce the policy?			OFGEM	
What is the total annual cost of enforcement for these organisations?			unknown	
Does enforcement comply with Hampton principles?			yes	
Will implementation go beyond minimum EU requirements?			no	
What is the value of the proposed offsetting measure per year?			unknown	
What is the value of changes in greenhouse gas emissions?			£ 4.6bn	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes	Yes	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ tbd Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Summary: Analysis & Evidence

Policy Option: Hybrid Supplier Obligation	Description: An obligation on suppliers to install energy saving measures and achieve an absolute reduction in greenhouse gas emissions from households.

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	
£	9	
Average Annual Cost (excluding one-off)		
£ TBC		**Total Cost** (PV) **£ TBC**

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

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	
£	49	
Average Annual Benefit (excluding one-off)		
£ TBC		**Total Benefit** (PV) **£ TBC**

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

Key Assumptions/Sensitivities/Risks

Price Base Year TBC	Time Period Years	**Net Benefit Range** (NPV)	**NET BENEFIT** (NPV Best estimate) **£ TBC**

What is the geographic coverage of the policy/option?			GB	
On what date will the policy be implemented?			TBC	
Which organisation(s) will enforce the policy?			TBC	
What is the total annual cost of enforcement for these organisations?			TBC	
Does enforcement comply with Hampton principles?			TBC	
Will implementation go beyond minimum EU requirements?			TBC	
What is the value of the proposed offsetting measure per year?			TBC	
What is the value of changes in greenhouse gas emissions?			TBC	
Will the proposal have a significant impact on competition?			TBC	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large
Are any of these organisations exempt?	Yes	Yes	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ tbd Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Summary: Analysis & Evidence

Policy Option: Arms-length Delivery Agency	Description:

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	
£	9	
Average Annual Cost (excluding one-off)		
£ TBD		**Total Cost** (PV) **£ TBD**

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

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	
£	9	
Average Annual Benefit (excluding one-off)		
£TBD		**Total Benefit** (PV) **£ TBD**

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

Key Assumptions/Sensitivities/Risks

Price Base Year 2008	Time Period Years	**Net Benefit Range** (NPV) **£**	**NET BENEFIT** (NPV Best estimate) **£ TBD**

What is the geographic coverage of the policy/option?				TBD	
On what date will the policy be implemented?				TBD	
Which organisation(s) will enforce the policy?				TBD	
What is the total annual cost of enforcement for these organisations?				TBD	
Does enforcement comply with Hampton principles?				TBD	
Will implementation go beyond minimum EU requirements?				TBD	
What is the value of the proposed offsetting measure per year?				TBD	
What is the value of changes in greenhouse gas emissions?				TBD	
Will the proposal have a significant impact on competition?				TBD	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium	Large	
Are any of these organisations exempt?	Yes	Yes	N/A	N/A	

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ tbd Decrease of £ **Net Impact** **£**

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Evidence Base (for summary sheets)

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

Introduction

The Secretary of State has imposed an obligation on electricity and gas suppliers to achieve carbon emissions reduction targets.[1] Policies discussed here will build on the success of the Carbon Emissions Reductions Target (CERT) and Energy Efficiency Commitment (EEC) as the Government's principal policy mechanism for cost-effective delivery of energy saving measures to households.

The 2007 Energy White Paper committed the Government to developing a Supplier Obligation (SO) post 2011 that will:

a) reduce carbon emissions from the domestic sector by 11 – 14.6MtCO2 by 2020;
b) create a shared incentive for energy suppliers and customers to reduce domestic emissions;
c) transform the market from selling units of energy to marketing energy services.

The EEC model has proved very effective at installing energy saving measures in homes. However, over the next decade we need to appraise whether in the longer term we need a different delivery model.

This document considers how following CERT there may be a requirement to introduce alternative means of policy delivery, either in combination with or as replacement of the SO-led concept. Whilst analysis of alternative delivery mechanisms to the SO at this point is necessarily preliminary and qualitative, it is possible to define criteria and objectives at this early stage of policy design against which to assess possible future delivery options.

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[1] Powers are contained in the Electricity Act 1989 and the Gas Act 1986, as amended by the Utilities Act 2000 and the Climate Change and Sustainable Energy Act 2006.

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1 Market Structure

Levels of energy efficiency in the household sector are not optimal, either from a personal or societal standpoint. Even measures that would reduce consumers' energy bills cost-effectively remain undone. Taking into account climate change and broader benefits of reduced energy usage (other environmental benefits, security of supply, fuel poverty), the gap between the ideal and what is achieved in practice widens further. This is due in part to a number of market failures and other barriers that prevent or impede consumers from taking up energy saving opportunities. No meaningful independent energy services industry currently exists for the residential sector.

Current measures under EEC are an effective means to save energy. However, the incentives for Suppliers are to focus on low cost opportunities. Over time, the supply of saving opportunities in easy reach may diminish and accordingly impediments to market efficiency may increasingly hinder policy implementation. Energy savings from the household sector depend on overcoming these barriers, particularly if we wish to see energy saving measures in demand from consumers. To the extent that these barriers can be overcome through policy intervention Government intervenes to achieve what markets cannot deliver on their own.

Therefore, evaluation is required to anticipate whether in future alternative forms of delivery may be more effective in meeting policy objectives.

Policy intervention in markets affects the interaction between suppliers and consumers. Our proposals are guided by expectations of how the market for the supply of energy efficiency measures may evolve by the next mid-decade. A review of these expectations is in order.

Figures 1 and 2 show we anticipate that only 2.5 million unfilled cavities will remain in 2014, and after 2016 there will be less than 1 million. Similarly from 2011 it is anticipated that there will be no lofts remaining with less than 50mm insulation and that thereafter, any remaining potential will be left in 'top-ups' to 200mm+, with limited carbon savings. We expect to achieve the majority of low cost energy saving opportunities by 2014/2016. Consequently, it will be necessary to install increasingly expensive and intrusive energy saving measures that require higher degrees of skill to install.

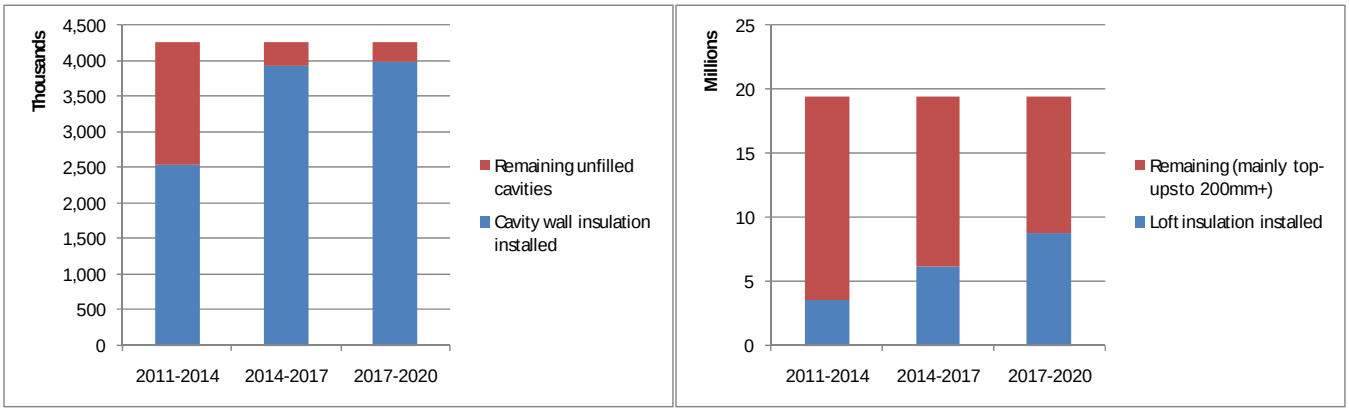
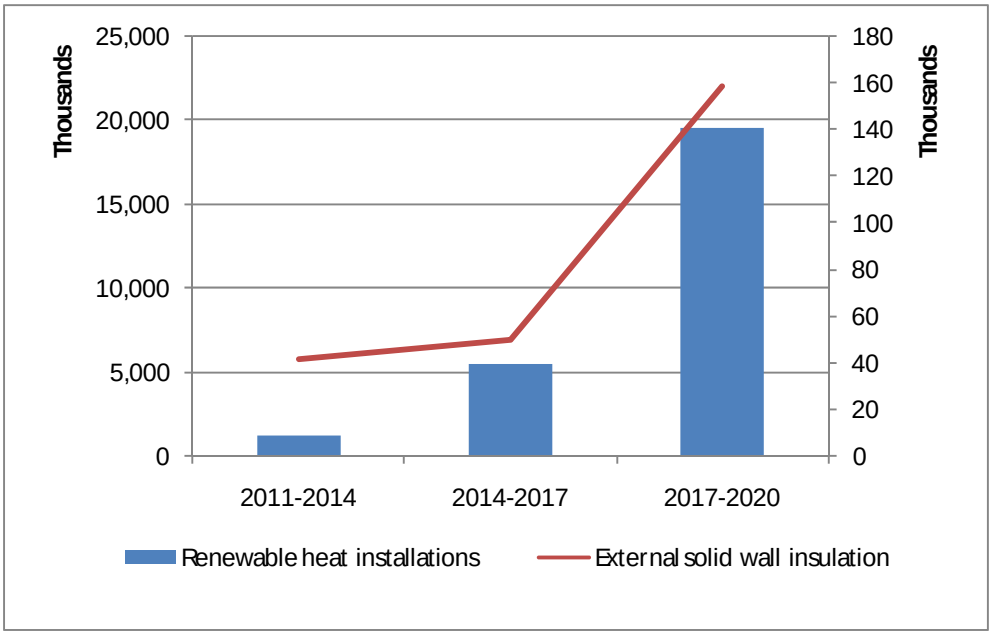


Figure 3 highlights that we anticipate a gradual ramping up of more expensive energy efficiency measures and renewable heat technologies after 2011. These present a more complex delivery challenge as consumer acceptance and understanding of these measures tends to be lower.



Practical factors that can potentially impede the delivery of improvements to household energy efficiency include a lack of appropriate market-ready technologies, lack of appropriate skills and constraints on the supply and installation of measures.

Barriers to household energy efficiency are discussed in the Overarching Impact Assessment. Here, market failures that can be mitigated by alternative delivery options are considered.

In situations where the cap is set in terms of carbon emissions, the EU ETS already effectively ensures that electricity prices reflect the environmental costs of carbon and so creates incentives to decarbonise the electricity supply. This ensures that the amount of electricity demanded is optimal from a societal standpoint. However, a number of downstream barriers prevent households from using energy in the most efficient way and so even though electricity prices reflect the environmental cost of carbon, the demand for electricity is not socially optimal. The supplier obligation approach aims to tackle downstream barriers.

Unlike the electricity sector, the gas market currently is not included in the EU ETS. Domestic gas prices do not reflect the environmental cost of carbon. Yet as for electricity there remains a

need to address downstream barriers that prevent households from using gas in the most efficient way.

1.1 Market Failures

Market failures and barriers that prevent welfare-maximising markets may become apparent in a range of factors, which include:

Consumer Behaviour

Information asymmetry is a barrier that may prevent consumers from achieving full potential of energy investments due either to underprovision of information or to high search costs. Intervention in information markets is required to deliver clear and coherent information. A related issue is inertia in consumer decision-making, where consumers even when aware of potential benefits do not take action to realize welfare gains. A possible block to consumer actions may be that commercial suppliers might not enjoy the same level of trust as central (or not-for-profit) advisor, or that information is more likely to motivate behaviour change when supplied by a single (central) rather than multiple sources. Effective mitigation consists of measures to create a positive and productive consumer experience.

Co-ordination of information

Suppliers will install individual energy efficiency measures ranked by their individual cost-effectiveness. As a result, potential energy savings may be missed when isolated energy efficiency measures could be improved by undertaking several measures either at once or in a particular sequence. Lack of co-ordination of information could be an obstacle where for example a whole-house approach would require a systematic appraisal of potential energy savings. Furthermore, fragmentation of information between suppliers may preclude exploring potential of energy efficiency measures where community-scale projects offer more cost-effective savings than installations in individual dwellings, for example by expansion of CHP or District Heating. Gaps in information co-ordination may also interfere with ensuring coherent or complementary application of potentially overlapping subsidies. Consolidated information on energy savings potential in individual dwellings may be more accessible to the not-for-profit sector than to private sector suppliers.

Perverse Incentives

Performance targets for suppliers apply to specific budget periods and this arrangement may induce gaming by suppliers. Once suppliers have complied with their set target for a given budget period, they may be inclined to delay installations, or restrict their activities to low cost measures. By 2015 we anticipate an increasing need to focus on higher-cost measures where barriers to take-up are greater. Over time, this potential risk may become more acute as the number of low cost energy efficiency measures will decrease. The effectiveness of supplier obligation type provisions may consequently diminish over time.

Competition in the market

It is the government's stated intention to open up the energy efficiency market to greater competition where feasible (see Energy White Paper). Where government can introduce measures that facilitate market entry, for example by third party installers or for Energy Supply Companies (ESCO's), it is appropriate to consider measures that bring down barriers to competition. A related issue is the promotion of competition through fostering technological

innovation, which may benefit from facilitating economies of scale and learning benefits through implementation of centralised, large-scale demand management.

Distributional Issues

Climate change policies where possible take into account the need to ensure fair and equitable distribution of costs.[2] Whilst distributional concerns are not market failures in the strict sense of the term, the burdens of costs are not spread fairly when a disproportionate share of costs ensuing from installations in energy savings are borne by consumers at the low end of income distribution. Particular policy measures currently aim to redress regressive imbalances, e.g. by setting explicit performance targets for energy efficiency installations in priority groups. As the market for energy supply measures evolves and the potential for installations at low cost diminishes, suppliers' and consumers' search costs will increase and high cost measures will be installed in a smaller number of dwellings. Increasing the concentration of benefits on fewer dwellings whilst spreading costs across all customers may make distributional imbalances more acute. Thus, there may be a need to increase targeting of priority groups.

2 Options

a) Do nothing
b) Outcome based policy: SO targeting a cap either on energy sales or on notional carbon emissions (not linked to the EU ETS)
c) Measures based policy: SO targeting a level of installations
d) A combination of both policies: SO targeting measures as well as outcomes
e) Delivery by Central Delivery Body

3 Do Nothing

Under a do nothing option supplier activity in installing energy saving measures in households would stop after CERT. As a result there would be fewer players driving demand for energy saving measures, which would lead to a contraction of the market, reducing the number of measures installed and the number of jobs created by the current obligation. Furthermore without the supplier obligation it is likely that carbon emissions from the domestic sector would increase in addition to a loss of consumer benefit from the installation of measures.

4 Move from CERT to a Supplier Obligation

We consider different versions of a Supplier Obligation (SO)

a) Outcome based policy: SO targeting a cap either on energy sales or on notional carbon emissions (not linked to the EU ETS)
b) Measures based policy: SO targeting a level of installations
c) A Hybrid Policy: SO targeting measures as well as outcomes.

[2] Energy White Paper (2007): "Every household in the UK should be able to heat and light their homes affordably. However for some people, meeting this basic energy need accounts for a disproportionate amount of their income."

4.1 SO as Outcome Based Policy

4.1.1 Supplier Obligation with Cap on Sales

We consider a cap applying to the following two alternatives: either energy sales or carbon emissions. We discuss these two alternatives in turn.

A cap could be designed to permit or preclude trading. Allowances are either auctioned or allocated to energy suppliers who would be required to surrender allowances equal to their sales of energy. Government controls the overall level of notional emissions by limiting the issuance of allowances, which creates a "cap". An outcome-based policy could target either the level of sales or the amount of notional carbon emissions from energy consumption.

A discussion how a cap on sales reduces energy demand follows.

A cap would be set below Business as Usual requirements. Government can reduce the cap as needed to deliver the desired outcome. Where a cap precludes trading, suppliers would face restrictions on the amount of energy they sell and incur fines for exceeding their cap. Where a cap permits trading, suppliers would buy or sell allowances on secondary markets as needed. Consumers' demand elasticity will determine the price of allowances. The lower the elasticity of consumer demand, the higher the price of allowances.

Note, under both of these options the cap would be on energy sales and not on carbon. This is because the objective of the SO is to reduce the amount of energy consumed in the domestic sector rather than to decarbonise the energy supply.

Suppliers will pass the cost of the allowances on to their customers in the form of higher energy prices, irrespective of whether allowances are auctioned or gratis. Increases in price will be the primary driver reducing energy demand.

A cap and trade scheme would not incentivise suppliers to install energy efficiency measures, because suppliers' profits increase from selling more energy. Suppliers installing energy efficiency measures would forgo profits earned from energy sales. Although suppliers reducing sales need to buy fewer allowances, the saving is below the opportunity cost of passing on the cost of allowances to customers.

A cap and trade scheme will reduce energy consumption, but not necessarily due to increased energy efficiency. Instead, much of the reduced energy consumption may come from households reducing their comfort levels, for example, because they may no longer be able to afford previous levels of consumption. Using price to reduce energy consumption may mean the poorest reduce consumption the most.

Example: Effect of Cap and Trade Scheme on Suppliers' Profits

Before introduction of Cap and Trade

Sales Price of Energy:	£11
Cost of Sale	£10
Profit:	£ 1

After introduction of Cap and Trade

Cost of Allowance:	£10
New Cost of Sale:	£20
New Sales Price of Energy:	£21
New Profit:	£ 1

The net effect of installing energy efficiency measures that save one unit of energy would be a foregone profit of £1. In our example, were suppliers to install measures if profits from installation would offset profits foregone from energy sales, profits would have to exceed £1. Independent energy service companies, on the other hand, would have an incentive to install measures even if profits were below £1. A cap and trade scheme, therefore, will not incentivise energy supply companies to install measures, but could help to facilitate the development of energy supply companies (ESCOs) to deliver energy efficiency measures. This would depend on the extent to which price increases induce household demand for energy efficiency measures and services.

Given the barriers preventing households from using energy efficiently, it would appear that energy price increases under a Cap and Trade scheme, on their own, are unlikely to substantially raise household demand for energy efficiency measures and services, and hence the development of an ESCO market.

Supplier Obligation, with Sales Cap and No Trade

Where a cap regime does not permit trading, there are two ways suppliers may meet a cap. They could either increase prices to reduce demand for energy or install energy efficiency measures in their customers' homes.

Prices Increases will reduce consumer demand and raise suppliers' profits. Whilst energy sales will be lower, the marginal costs of supply will also be lower. Hence, the profit from each individual unit of sales will be higher. Clearly, this would appeal to energy suppliers. However, when price increases the main driver for reducing energy consumption, this may not lead to improved energy efficiency but rather to losses in comfort.

Suppliers would only exercise the option to install energy efficiency measures when they believe that they could win customers from other suppliers by charging lower prices without breaching their sales cap. This depends on customers' price sensitivity and willingness to switch suppliers to exploit price differences. Price discrimination strategies between suppliers and even within their own customer base suggest that suppliers may not pursue this strategy. Further, possibly customers most likely to switch suppliers will be those who consume most, and suppliers may refuse these customers to avoid breaching their cap. Moreover, even where suppliers install measures, they would focus on measures in their own customers' homes and even then, only on measures that are cost-effective in the short run to ensure they capture the benefit.

4.1.2 Supplier Obligation with Cap on Emissions

A cap on notional carbon emissions, rather than on sales, would affect the market differently. The level of the cap will determine costs. If the outcome cap is set at a higher level of ambition than the corresponding sales target, costs for suppliers are likely to increase because suppliers then need to comply with an increased overall obligation, failing which they would be required to increase the volume of installations. This assumes they are not allowed to buy EU ETS allowances.

Alternatively, if the level of ambition of the outcome cap is set at a lower level of ambition than that of the corresponding measures target, suppliers may not incur additional requirements. In that case, the result would be no different from a sales based obligation. The level of outcome cap is therefore critical to the impact of this policy.

However, setting the level of cap will need to take into account factors beyond the control of suppliers, such as the weather and introduction of new technologies. It will be difficult to account for these factors ex ante and consequently to know beforehand how stringent a cap will be for suppliers to meet (particularly as they are not allowed the option of a buy-out).

If the reward for suppliers for complying with their emissions cap would be to reduce the level of required installations, costs may increase in the short term but decrease in the long term.

In the short run, costs are likely to increase because suppliers may undertake either more measures or more expensive (but more effective) carbon abatement measures, to reduce the number of installations required in future. Suppliers will do this if they assess this course of action leads to lower long run costs. Long run cost decreases will depend on the cost and effectiveness of measures that suppliers install.

A notional emissions cap would give suppliers an incentive to promote consumer behaviour that reduces emissions, provided this would be cheaper than future installation costs. In that case, a set amount of carbon could be abated at a lower cost than solely by a measures based target.

However, it would be difficult to establish the reduction in measures for a given emission reduction. Given numerous factors potentially affecting carbon emissions it could prove very difficult to credit a reduction in carbon emissions to the actions of a supplier. Hence, although in theory this option may incentivise suppliers to consider more carefully actual emission reductions rather than solely emission reduction scores, difficulties in assigning credit to suppliers may undermine supplier incentives.

The ultimate emitters of carbon are householders rather than suppliers, so it will be difficult for suppliers to know whether installing a certain measure or promoting a given behaviour change will actually result in the expected emission reduction. Suppliers may avoid the risk of introducing behavioural measures when they cannot be sure of a pay back.

Under an alternative policy design, suppliers would be required to achieve a reduction in demand from a certain proportion of their customer base. The cost could potentially be lower if suppliers could achieve behaviour changes at a cost lower than installing measures.

In order to demonstrate that customers reduce their energy demand, suppliers will however face a new cost, that of monitoring customer's energy usage. Absent smart meters providing accurate records of customers' energy usage, demonstrating reductions may prove difficult. Hence, installation of smart meters may be a prerequisite.

An outcome-based component is expected to create an incentive for suppliers to promote low cost behaviour measures. However, if suppliers meet any outcome-based target simply by increasing prices to reduce demand this will thus lead to considerable distributional impacts and could lead to large deadweight losses.

4.1.3 Costs of a SO Outcome based Policy

The main costs under an outcome based scheme are the loss of consumer and supplier surplus from increased prices.

Restricting energy sales will raise energy prices. This reduces benefits to consumers from lower energy prices. When prices are low, many consumers will be able to purchase energy for less than what they would be willing to pay for it. This difference is the consumer surplus. However, when prices increase, the consumer surplus will also shrink. For some consumers,

this new higher energy price will exactly equal their willingness-top-pay (so consumer surplus is zero) or will exceed their willingness-to-pay (so consumer surplus is negative).

Shrinking consumer surplus to zero will be a cost to consumers, but not to society either overall as this cost will be "transferred" to the producers (as supernormal profits if allowances are freely allocated) or to the government (as revenues, if allowances are auctioned). However, where the consumer surplus is negative, this cost is not transferred and thus an overall cost to society ensues.

For suppliers, costs or benefits from this option depend on whether allowances are free or auctioned. Regardless how allowances are allocated, suppliers will pass on the value of the allowances to their customers in the form of higher energy prices.

Suppliers earn supernormal profits from free allowances by charging a higher energy price without having increased costs – indeed their variable costs will have decreased slightly since they are supplying less energy. This supernormal profit will be at the expense of consumers, as higher prices reduce consumer surplus.

If allowances are auctioned suppliers will charge as much for energy supplied as under free allocation, but supplier costs increases by the auction price. They lose some "producer" (or "supplier") surplus and hence supernormal profits.

Supplier surplus is the benefit to suppliers from selling energy at a price above their willingness-to-sell. With auctioning, suppliers achieve lower revenue from selling less energy than before introduction of a cap and trade scheme. The premium between the price suppliers achieve and the price they would be willing to sell will decrease. This price reduction may result in negative supplier surplus.

Again, a decrease in supplier surplus to zero will be a cost to producers, but not to society overall since it will be a "transfer" to government in the form of auction revenues. When supplier surplus is negative, however, there will be a cost to society since this cost does not "transfer" to anyone but is lost.

Accurate quantification of these losses to consumer and supplier surplus depends on household demand and energy industry supply curves.

However, restricting energy supply (without changing energy demand through improved energy efficiency) will create deadweight loss, so the overall costs of the scheme will outweigh quantifiable benefits. The deadweight loss represents the net cost to society.

Since the retail price for gas does not include a carbon price component (unlike the price for electricity), a cap on gas need not incur a deadweight loss. A deadweight loss would result only when the cap is set too low (i.e. to a level below the social optimum of gas demand).

Administration Costs

A cap and trade scheme also incurs administration and running costs. Suppliers may need to undertake a considerable amount of learning, although not expected to be of the same order as with the EU ETS. Suppliers would most likely respond to this scheme by increasing prices, rather than finding ways to decarbonise.

4.1.4 Benefits of the SO Outcome-based Policy

Carbon and Energy Savings

Carbon emissions reductions are valued in two different ways. Electricity generation is in the EU Emissions Trading Scheme, so any carbon savings from reduced electricity consumption are valued at the EU allowance price. By reducing UK carbon emissions, the UK needs to buy fewer EU allowances and so saves the value of the allowances. Benefits from reduced emissions in the electricity sector will be around £0.5 bn.

Gas, on the other hand, is outside the EU ETS, and so carbon saved is valued at the Shadow Price of Carbon (SPC). The SPC reflects the social cost of carbon that is not reflected in the domestic price for gas, so the true savings of reduced gas consumption needs to factor in the saving in social (carbon) costs. We expect reduced gas sales to save the UK economy £1.2 bn in net present value terms.

An outcome-based scheme would not create significant incentives to install measures, so there would be no lifetime savings beyond 2020. There is a possibility high energy prices may drive some households to install measures voluntarily, but this has not been calculated here. Furthermore, an outcome based approach imposed only on gas and electricity suppliers would not lead to carbon reductions in other heating fuels such as oil and coal.

Table 1 shows a cap designed to deliver a reduction of 12.6M tonnes of CO2 a year by 2020 would save around 7.3TWh/yr of electricity and around 51.1TWh/yr of gas by 2020. Over the policy lifetime, energy saving would be around 321TWh. The net present value of these energy reductions represent a saving of approximately £5.2bn. This saving arises because we no longer need to spend so much on the variable costs of delivering energy[3].

Table 1

Benefits of a Cap and Trade System	Life time	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Savings after 2020**
Annual energy Savings compared to BAU (TWh/yr)		**5.8**	**11.7**	**17.5**	**23.4**	**29.2**	**35.0**	**40.9**	**46.7**	**52.6**	**58.4**	**0.0**
Of which from electricity		0.7	1.5	2.2	2.9	3.7	4.4	5.1	5.9	6.6	7.3	0
Of which from Gas		5.1	10.2	15.3	20.4	25.5	30.6	35.8	40.9	46.0	51.1	0
Total Savings TWh	**321**											
Annual Comfort Savings compared to BAU (TWh/yr)		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Of which electricity		0	0	0	0	0	0	0	0	0	0	0
Of which gas		0	0	0	0	0	0	0	0	0	0	0
Annual Carbon Savings compare to BAU (MTCO2/yr)		**1.26**	**2.52**	**3.78**	**5.04**	**6.3**	**7.56**	**8.82**	**10.08**	**11.34**	**12.6**	**0**
Of which from electricity		0.315	0.63	0.945	1.26	1.575	1.89	2.205	2.52	2.835	3.15	0
Of which from Gas		0.945	1.89	2.835	3.78	4.725	5.67	6.615	7.56	8.505	9.45	0
Value of Discounted Energy Savings (£m)		**110.6**	**214.5**	**312.7**	**406.9**	**494.5**	**577.8**	**655.3**	**727.6**	**795.7**	**856.1**	**0**
Of which from electricity		38.0	73.5	107.1	139.0	169.1	198.5	225.3	250.2	273.9	292.8	0
Of which from Gas		72.6	141.1	205.7	268.3	326.0	380.2	431.2	479.0	523.7	565.5	0
NPV £m	**5,152**											

[3] The value of energy savings were calculated using variable cost element of electricity and gas price as given in the guidance.

Value of Discounted Carbon Savings (£m)		**28.6**	**56.5**	**95.6**	**125.8**	**155.3**	**183.7**	**211.5**	**238.9**	**265.1**	**290.8**	**0**
Of which from electricity		5.4	10.9	28.2	37.2	46.2	54.8	63.3	71.6	79.9	87.8	0
Of which from Gas		23.1	45.7	67.3	88.5	109.1	129.0	148.2	167.3	185.2	203.0	0
NPV £m	**1,652**											

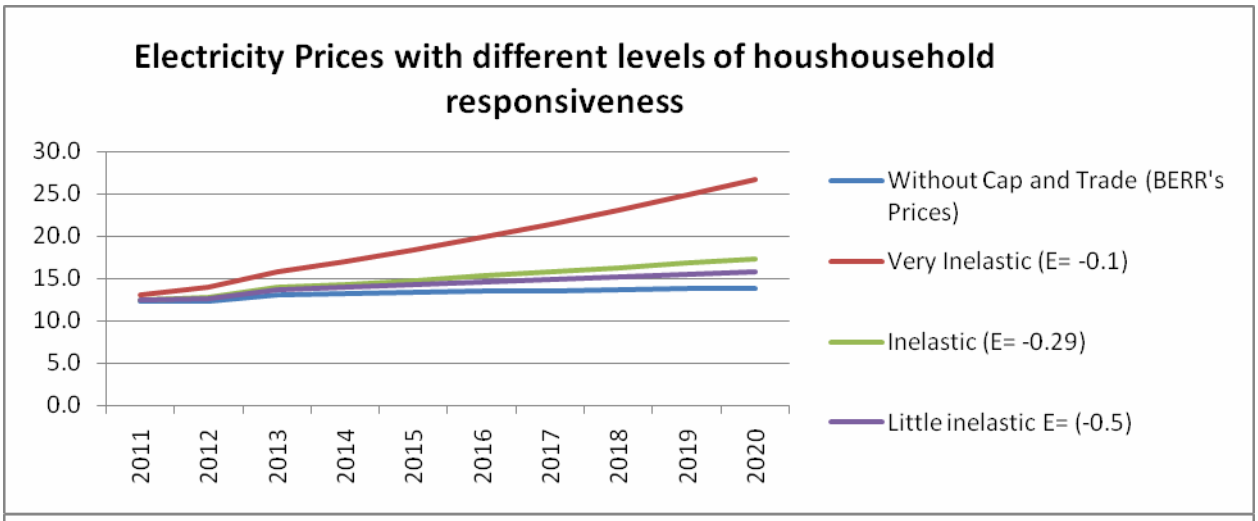
We expect the total benefit from a Cap and Trade scheme to be around **£6.8bn** between 2011 and 2020.

Reducing total UK energy consumption will also help to reduce the cost of meeting the UK's Renewable Obligation (RO). The RO requires sourcing 15% of the UK's energy consumption from renewable energy sources. If the UK's total energy consumption falls by 58.5TWh by 2020, then the reduced requirement for generation from renewable sources will provide benefits of around £4.1bn. This would take the total benefits to the UK to **£10.9bn.**

4.1.5 Distributional Impacts

Household demand for energy is fairly unresponsive to changes in the price of energy. An outcome-based scheme will lead to some rather large increases in energy prices in order to reduce demand to the level required to meet the cap.

Price increases will depend on how households respond to changes in energy prices. The graphs below present the effect of different levels of responsiveness to gas and electricity prices.



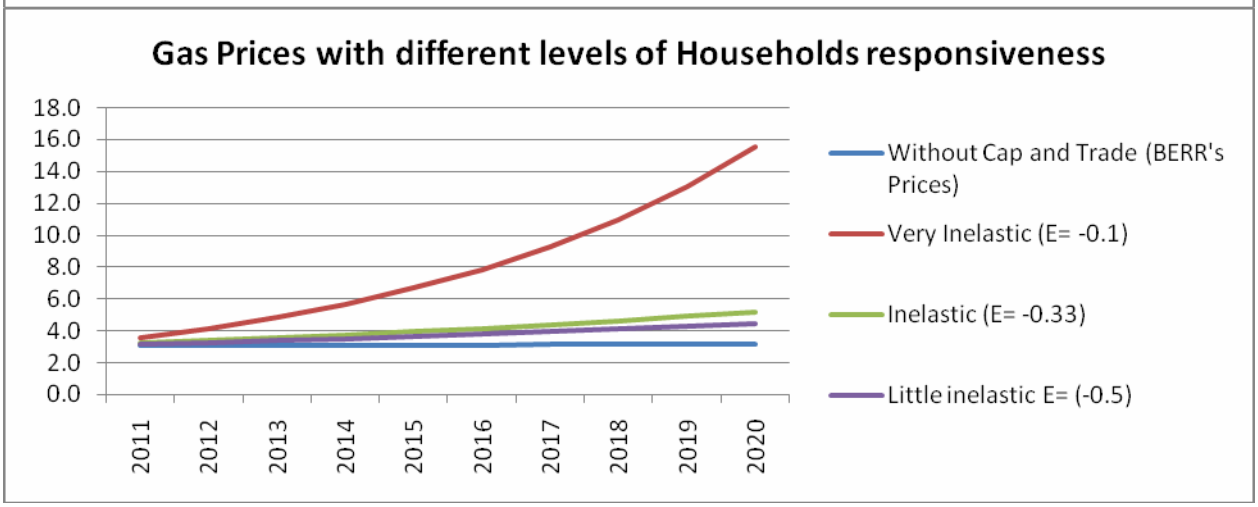


Table 2 shows that If households' energy demand responds relatively effectively to price increases (elasticity of demand equal to -0.5), then by 2020 electricity and gas bills may increase by around £41 and £87/yr, respectively.

On the other hand, if households are relatively unresponsive to price changes (a price elasticity of demand equal to -0.1), then by 2020 electricity and gas bills could increase by around £490 and £1605/yr, respectively.

DECC estimates of household demand elasticity is between these two figures (Electricity: -0.29, Gas: -0.33). We estimate in 2020 electricity and gas bills may increase by £106 and £193, respectively.

Table 2

Price elasticity	Increase in household gas bill (£)	Increase in household electricity bill (£)
-0.5 for both	87	41
-0.1for both	1605	490
-0.29 for elec -0,33 for gas	193	106

These price increases will disproportionately affect the poorest and will cause a considerable increase in the number of households living in fuel poverty – defined as spending more than 10% of income on energy.

Transfer of Consumer and Supplier Surplus to Government

Auctions of allowances are estimated to transfer approximately £40.67bn consumers and producers (suppliers) to the government. This estimate uses central estimates of energy demand responsiveness for households, and unity responsiveness for suppliers.

4.2 Measures Based Policy

This option effectively continues the current CERT. Suppliers will face a carbon reduction target that they need to meet by installing energy efficiency measures. Each energy efficiency measure will have a carbon "score" and so suppliers install energy efficiency measures until they reach their carbon reduction target. At least 40% of measures are applied in "priority group" homes.[4]

The evidence from EEC (2002-05), EEC 2 (2005-08) and the initial evidence from the first quarter of CERT show that measures based policy design succeeded in overcoming barriers to energy efficiency in the domestic sector and ensuring energy efficiency measures installed in people's homes reduce household carbon emissions and overall energy costs.

The initial feedback from the first two quarters of CERT suggests suppliers have already achieved reductions of around 57MtCO_2 (original lifetime target: 154MtCO_2.) Insulation and lighting account for the majority of savings, but several appliance schemes are in development to deliver carbon savings later.

[4] This largely consists of those on benefits or low income.

An input based mechanism allows suppliers flexibility in terms of the numbers and types of measures installed and households targeted. Many suppliers achieve cost-effective delivery by targeting household groups, such as social housing blocks.

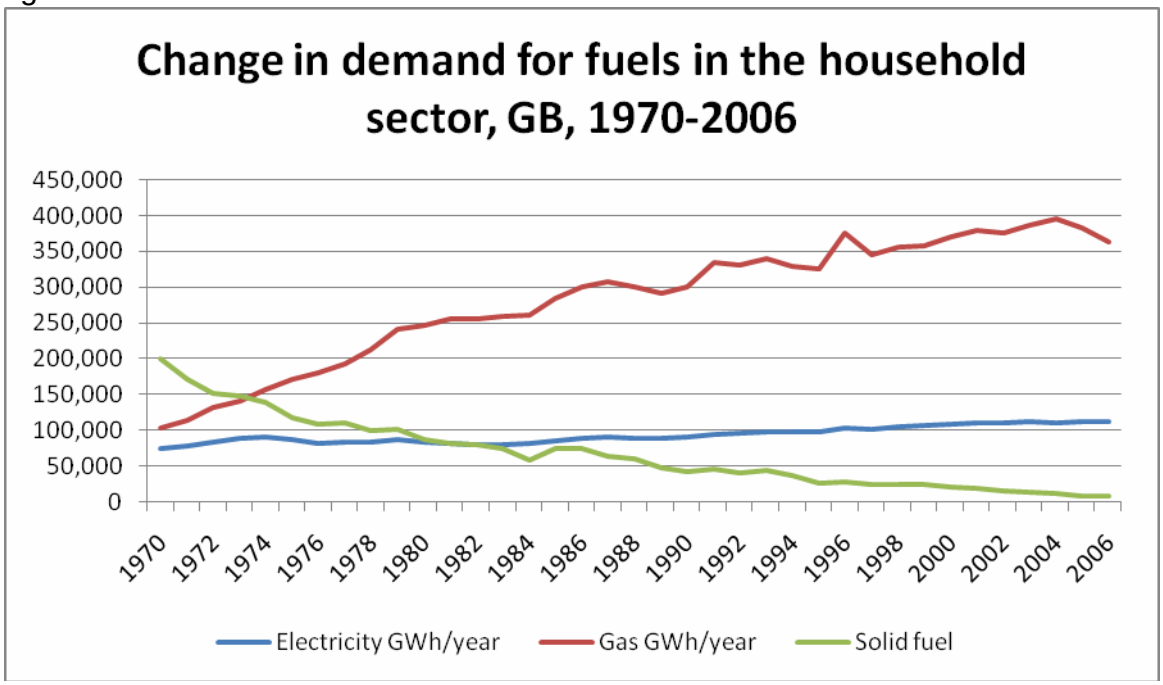
The current input-based policy ensures that low-cost energy efficiency measures will be installed that reduce both carbon emissions and energy bills over their lifetime whilst improving household comfort levels. By contrast, an outcome-based supplier obligation would also reduce emissions, but through higher energy prices with fewer energy efficiency measures installed and with lower levels of comfort, especially for poorer households. Furthermore, the current input-based policy design has facilitated innovation as suppliers develop new energy saving measures and find new ways of marketing measures.

However, an input-based supplier obligation presents some issues we need to address, such as

- The introduction of Carbon Budgets requires greater certainty of outcome in terms of absolute carbon emissions reductions;
- In future, increasingly expensive energy efficiency measures will be needed to ensure emissions reductions. Higher cost measures may require new ways of encouraging consumer uptake to avoid significant increases in energy bills and an unfair distribution of measures.

Figure 1 highlights that demand for energy has decreased in the last three years, against a long-term trend of increasing consumption. If this trend continues, an input-based supplier obligation would slow but not stop an increase in carbon emissions. In that case, some kind of outcome focus in an input based design may achieve greater certainty around absolute emissions reductions.

Figure 1

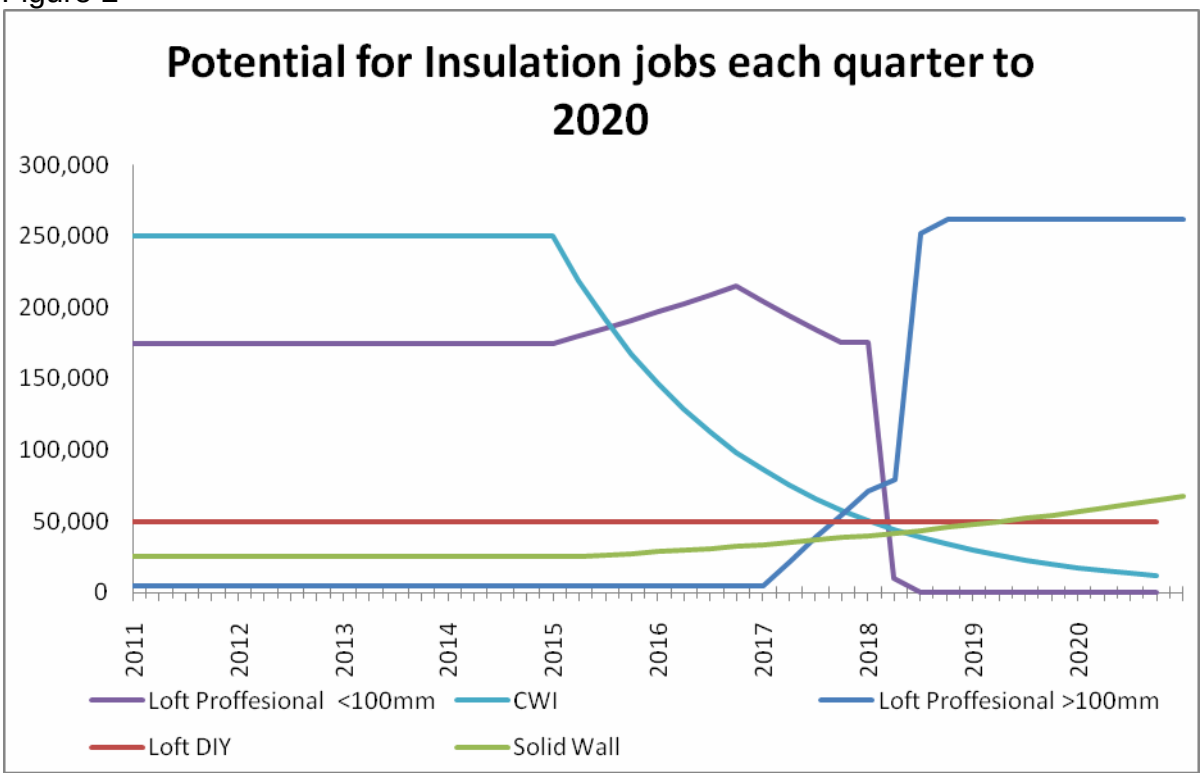


Source: DECC

Our assessment of potential measures by supply companies as outlined in Annex A suggests remaining potential for cavity wall and loft insulation in the domestic sector. Figure 2 shows the potential for these low cost measures will start to dwindle by around 2016, following treatment of the majority of cavities. Further reduction in emissions will require increasing numbers of more expensive energy efficiency measures, such as solid wall insulation.

Higher cost measures have significant consequences for the overall costs and distributional impacts of the policy.

Figure 2



Source: CIGA – Retrofit insulation road map, June 2007.

4.2.1 SO Input based Scheme: Costs and Benefits

Costs and cost effectiveness of an input based policy

Under an input based policy, the main costs relate to the cost of the energy efficiency measures installed by suppliers. Annex A outlines our assumptions around the number and type of measures that suppliers might install to achieve a target of at least 12.6MtCO2/yr in 2020. The cost of installing all these measures would be around £20.5bn with an NPV of £15.9bn

Our projections show the policy is highly cost effective. Further work is under way to apportion the cost effectiveness to the traded and non-traded energy sectors, in accordance with internal guidelines for methodology of cost benefit analysis. The subjoined table shows that this policy generates a positive benefit (£95 and £67 in the traded and non-traded sectors, respectively).

Dividing benefits into traded and non-traded sectors			
all £ in billions, **except for NPV/tCO2 saved**	Traded	Non-traded	TOTAL
Reduced energy consumption	7.0	10.9	17.9
Comfort benefits	0.7	3.0	3.7
Reduced purchase of EU-ETS allowances	2.3	0.0	2.3
Benefits of reduced carbon emissions in non-traded sector £billions	0.0	4.8	4.8
Displaced renewables capacity	1.6	10.6	12.2
Total benefits	11.6	29.3	40.9

Lifetime CO2 savings MtCO2	81.1	256.0	337.1
Total costs	3.8	12.1	15.9
NPV	7.7	17.2	25.0
NPV per tCO2 saved	**£95.4**	**£67.3**	**£74.0**

Benefits of an input based policy

The principal difference in the benefits between the outcome and input based supplier obligation arise from the number of measures installed in the period 2011-2020. An input based scheme would ensure the installation of measures during that period that would continue to have lifetime benefits beyond 2020. Conversely an outcome based scheme that reduced emissions through price impacts would not necessarily deliver the same lifetime benefits, but would instead only deliver benefits during the period of the policy. Furthermore, as is expressed below an input based scheme would reduce emissions from oil and coal use that would not be covered by a cap on the energy supply companies.

Carbon and Energy Savings

Table 3 below shows a measures based policy with a 2020 target of 12.6MtCO2 reductions p.a. would reduce electricity demand by 11.6TWh a year on and gas demand by 29.6TWh. In addition, the policy would save around 2.8TWh/yr from oil and 4.2TWh/yr from coal. Over the lifetime of the measures around 1,440TWh of energy will be saved. As measures are installed this could save 12.6M tonnes of CO2 by 2020. The energy reductions represent a net present value saving to the UK economy of approximately £17.9bn. This saving arises because we no longer need to spend so much on the variable costs of delivering energy[5].

As above, reduced demand for electricity means the UK requires fewer EU ETS allowances. Reduced emissions in the electricity sector will provide around £2.3bn in benefits.

An input based scheme would also reduce carbon from use of gas, oil and coal. These sources are outside the EU ETS and so are valued at the social cost of carbon. Reduced carbon emissions from these fuels would provide around £4.6bn in benefits.

Unlike an outcome-based scheme, an input based scheme creates incentives to install measures that would increase the comfort levels of households. These benefits amount to around £3.74n.

TABLE 3	Total Lifetime savings	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total accumulated savings after 2020
Annual Energy Savings cf Business as Usual TWh/year												
Of which electricity	**188**	0.00	1.29	2.58	3.86	5.15	6.44	7.73	9.02	10.31	11.59	130.35
Of which gas	**1,064**	0.00	3.29	6.57	9.86	13.15	16.44	19.72	23.01	26.30	29.59	915.76
Of which oil	**105**	0.00	0.32	0.64	0.96	1.28	1.60	1.92	2.24	2.56	2.88	90.51
Of which coal	**94**	0.00	0.47	0.94	1.41	1.88	2.35	2.82	3.29	3.77	4.24	72.46

[5] The value of energy savings were calculated using variable cost element of electricity and gas price as given in the guidance.

TABLE 3	Total Lifetime savings	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total accumulated savings after 2020
Of which biomass	-10	0.00	-0.04	-0.08	-0.12	-0.16	-0.20	-0.24	-0.28	-0.32	-0.36	-8.51
TOTAL fuel saved over lifetime of measures, TWh	1,440											
Annual fuel used for comfort TWh /year												
Electricity	12.68	0.00	0.04	0.08	0.11	0.15	0.19	0.23	0.27	0.30	0.34	10.97
Gas	202.37	0.00	0.53	1.07	1.60	2.13	2.67	3.20	3.73	4.27	4.80	178.37
Oil	14.11	0.00	0.04	0.08	0.12	0.17	0.21	0.25	0.29	0.33	0.37	12.25
Coal	2.92	0.00	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.08	2.53
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total TWh of fuel used for comfort (lifetime of measures)	232.08											
Annual CO2 savings MtCO2 (net of deadweight & comfort taking)												
from electricity	81.14	0.00	0.56	1.11	1.67	2.22	2.78	3.33	3.89	4.44	5.00	56.16
from gas	202.03	0.00	0.62	1.25	1.87	2.50	3.12	3.75	4.37	4.99	5.62	173.93
from oil	26.16	0.00	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	22.57
from coal	28.05	0.00	0.14	0.28	0.42	0.56	0.70	0.85	0.99	1.13	1.27	21.71
from biomass	-0.26	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.21
TOTAL MtCO2 (lifetime)	337.12											
Value of annual discounted energy savings to the UK £millions/year												
From electricity	6,985	0.00	66.80	129.73	189.27	245.45	299.86	349.93	396.36	440.49	476.49	4,390.87
From gas	8,522	0.00	46.98	91.34	133.98	173.63	210.95	246.02	278.95	309.82	338.72	6,691.27
From oil	1,243	0.00	6.72	13.05	19.07	24.76	30.15	35.24	40.04	44.56	48.63	981.24
From coal	1,120	0.00	9.10	17.44	25.15	32.11	38.96	45.17	50.91	56.22	61.39	783.63
From biomass	Detailed prices not available for biomass											
TOTAL PV of energy savings to UK £millions	17,870											
Value of annual discounted comfort £millions/year												
From electricity	£741	0.00	3.79	7.36	10.72	13.89	16.92	19.73	22.34	24.81	26.97	594.58
From gas	£2,737	0.00	14.36	27.84	40.48	52.31	63.38	73.72	83.62	92.63	101.00	2188.06
From oil	£228	0.00	1.22	2.37	3.47	4.49	5.46	6.37	7.22	8.01	8.76	180.18
From coal	£35	0.00	0.20	0.38	0.55	0.70	0.84	0.98	1.11	1.22	1.33	28.01
From biomass	Detailed prices not available for biomass											
TOTAL PV of comfort £millions	3,741											
Value of annual discounted carbon savings £millions/year												
From electricity	£2,257	0.00	9.92	34.30	50.93	67.36	83.25	98.96	114.30	129.56	144.13	1,525
From gas, oil & coal & biomass	£4,823	0.00	21.14	41.53	61.42	80.71	99.39	117.46	135.33	152.21	168.96	3,945
TOTAL PV £millions	7,081											

Total benefits of an input based scheme between 2011 and 2020 would provide around **£28.7bn**.

An input based scheme would save expenditure to meet the 15% renewable energy generation target by 2020. This would increase benefits by around £12.162bn, taking the total to **£40.9bn**.

Overall an input based scheme would provide a net benefit (benefits minus costs) of around **£12.79bn,** but adding the benefits of renewable energy increases the net benefit to **£25bn**.

Distributional impacts

Distribution of policy costs depends on the extent to which supply companies subsidise installation. CERT assumed suppliers pay 65% of total costs, but in the able-to-pay would subsidise major measures sector by around 50%. This analysis has assumed CERT subsidies in the first 3 years, then 65% in able-to-pay for the next 3 years, then 75% in able-to-pay for the last 3 years. Table 4 shows the how costs are distributed under these assumptions (costs are not discounted).

Table 4	**Non-discounted costs in £ billion**
Suppliers' costs	**12**
Householders' costs	**5.7**
Social Housing Providers' costs	**2.7**
Total costs	**20.5**

Suppliers would pass on costs to consumers through higher prices. Table 5 shows the impact on energy bills if suppliers' subsidies are as per above assumptions.

Table 5	**April 2011-March 2014**	**April 2014 – March 2017**	**April 2017-March 2020**
Average annual cost passed on per household	£40	£43	£66

If however supplier subsidise 100% of the cost of measures then the distribution of cost would fall completely on suppliers but be passed through to consumers bills leading to an increase in consumer bills along the lines of table 6

Table 6	**April 2011-March 2014**	**April 2014-March 2017**	**April 2017-March 2020**
Average annual cost passed on per household	£69	£76	£107

The total benefit across all households will amount to around £1.755bn per year saving around £55 per household, on average over the lifetime of the measures. The exact distribution of benefits is harder to assess as it depends how many households are targeted by supply companies and the types of measures they install. In practice, once supply companies install more expensive measures we expect fewer households to receive them (because more expensive measures save more carbon and so supplier targets are reached by fewer installations). However, all consumers will pay.

4.3 Combining Outcome and Measures Based Policy

A third option would be to continue an “input based” scheme and incorporate the potential for including an outcome target. This hybrid design would combine a measures-based target, requiring supply companies to install energy efficiency measures in domestic sector properties in order to meet a specific target, with an outcome target in respect of carbon emissions. This option combines the first two alternatives. Suppliers would still have a measures-based obligation but they would also have a outcome-based element. These options would require suppliers to reduce actual carbon emissions as opposed to “scored” carbon emissions. Two types of outcome based cap would be possible: a cap with or without a trading option.

Ways in which this could be designed include:

- If suppliers breach their cap, a penalty would require installation of more energy efficiency measures in the following year;
- If suppliers stay within their cap, a reward would be to reduce their measures based target in the following year.
- Suppliers may be required to demonstrate reductions in demand from a certain segment of their customers

4.3.1 Market Failure

We consider how a hybrid policy would mitigate individual market failures.

Consumer Behaviour

Under a measures-based obligation, suppliers discharge their responsibility by installing measures but are not responsible to attend to efficient use of these by their customers. The additional imposition of an outcome cap would require suppliers to improve their knowledge of consumer behaviour and to devote resources to influencing energy use. An outcome-based obligation would encourage supplier effort on reducing information asymmetry.

Coordination issues

The introduction of an outcome cap would induce suppliers to gather information on measures that may achieve a higher degree of carbon savings, for example through integrated installation of measures rather than through installation of measures in isolation. This would improve not only the efficient application of information within an individual supplier’s franchise, but may also encourage exchange of information between suppliers regarding opportunities for energy savings that exist by bracketing measures across several dwellings. Examples are CHP or District Heating.

Perverse Incentives

Outcome targets provide greater certainty of achieving carbon savings directly rather than through compliance with a proxy (such as individual ‘scores’ for measures). An outcome target thus ensures suppliers are motivated to act in the interest of this ultimate policy goal rather than be content with hedging their actions with a view to complying with performance criteria. An outcome-based target provides an incentive to accelerate installation of measures so as to ensure a margin of comfort in respect of compliance with an outcome cap.

Distributional Impacts

Since outcome based targets are essentially a form of rationing, suppliers are most likely to respond to such rationing through increasing their prices. This will benefit suppliers but not consumers.

When outcome targets are linked to suppliers' energy supply, there would be no incentive to install measures that might confer benefits on their competitors. Rather, suppliers would focus their efforts on meeting their dual measures and outcome target. Suppliers will restrict installation of measures to homes of their own customers.

Another implication of introducing outcome targets is that suppliers may avoid installing measures in households expected to avail themselves of comfort taking, i.e. where the household does not reduce the amount of consumption but prefer to enjoy a warmer home. As the propensity for comfort taking is higher among the less well off, an outcome-based target may result in fewer installations in lower income households.

4.3.2 Costs and Benefits

The effect of imposing a second target on suppliers would differ depending on the level the cap is set. Suppliers would aim to meet the higher of the two targets and would prioritise their efforts on measures that fulfil both quotas simultaneously. Unless the outcome-based cap is more stringent than the measures-based cap, it would have no discernible effect on the market, because suppliers through compliance with measures-based requirements would be able to discharge their outcome-based requirements. On the other hand, the outcome-based cap would have an effect on suppliers if meeting this target would require either additional or different measures.

A very low cap would induce a step change in the rate of installation of measures, or would induce efforts to influence behavioural changes. Benefits, in terms of energy and carbon savings, consequently are likely to be significantly higher than under a pure measures-based obligation. This additional benefit would be due to the increased level of ambition in terms of the actual amount of saved carbon. Arguably, a higher level of ambition for the measures-based target would lead to the same outcome. The mechanism effecting overall carbon savings is the level of ambition rather than the link to outcomes per se.

If suppliers were rewarded for overachieving emission reductions by a lower measures-based target in subsequent periods, short run benefits may increase because suppliers would seek accelerate installations to reduce carbon emissions to stay below their cap. In the longer run, however, as suppliers' reduced measures-based obligations run off, benefits will also be reduced. The overall effect could thus be that energy and carbon savings may be the same, but savings will be brought forward.

An important caveat is that carbon savings resulting from behaviour change may reverse over time. A trade off of behavioural measures against physical measures will need to take consider how long benefits will last. Households may change behaviour whereas it is unlikely they would remove physical measures, once installed.

4.4 Delivery by Central Coordinating Body

The Energy White Paper (2007) announced the intention to continue with a Supplier Obligation until 2020 and also set out the intention to promote where possible changes to energy market structure to raise consumer welfare. In view of the dynamic evolution of market structures we need to consider whether there are alternative mechanisms of delivery that are more effective. One such option would be the formation of a Central Coordinating Body to co-ordinate delivery of energy efficiency measures. It could be envisaged that data for Smart Meters would be channeled to the fund to allow it to coordinate installation of whole house measures and the like.

Given the nascent stage of policy design, the following sections consider the conceptual ramifications of prospective work on impact assessment. We are conscious that funding and interaction between public and private sectors would have a material impact on the modus operandi and impact of a Central Coordinating Body.

Institutional Design of Delivery

The formation of a Central Coordinating Body would transfer performance targets to a central body and oblige suppliers to contract out of their commitments. This approach would require suppliers to pool funding for energy efficiency measures. Government could set overall targets and direction..

A discussion how this option would mitigate market failures follows.

4.4.1 Market Failure

Consumer Behaviour

Delivery by a Central Coordinating Body may mitigate adverse consequences of information asymmetry and of detriment to consumer welfare from lack of information co-ordination. Research on consumer awareness provides evidence that consumers in the UK "have a noticeably lower level of trust in information about energy related issues than other Europeans."[6] Where consumers face advisors employed by a central body (which may be a not-for-profit entity) the level of trust may be higher than in cases where the intermediary is engaged by an individual company. Consequently, this may encourage a more positive response from consumers.

Co-ordination of information

A further market failure that could be addressed by a Central Coordinating Body is that fulfillment of targets under CERT requires installation of physical measures in individual dwellings. Suppliers in their selection process will limit installations to dwellings where suitable efficiency investments match the criteria under CERT. By implication, integrated energy efficiency investments are not a priority and there is no incentive for suppliers to gather information on additional potential CO2 savings that could result from integrated solutions, such as installations encompassing several dwellings.

[6] Logica: *Turning concern into action: Energy efficiency and the European consumer*, September 2007.

A Central Coordinating Body would provide Local Authorities with a single rather than multiple counterparties. Whilst establishment of a Central Coordinating Body would incur set up and administration costs, there would be a balancing reduction of administration costs for Local Authorities. Furthermore, centralised direction of activities in a Central Coordinating Body would permit rapid dissemination of information across Local Authorities.

Increased involvement of Local Authorities in implementation of energy efficiency measures would create potential for promoting initiatives of neighbourhood or community groups, which would support the government's aspiration of creating a positive consumer experience.

Perverse incentives

Targets are allocated to individual suppliers in a way that may induce gaming. For example, suppliers that anticipate they can meet their targets with ease will relax their efforts. Furthermore, the particulars of targets do not necessarily reward energy efficiency installations that involve improvements to multiple dwellings or to neighbourhoods, or where carbon savings ensue from gradual expansion of particular measures over a timeframe extending beyond immediate budget periods, such as by District Heating.

The establishment of a Central Coordinating Body could enable close oversight by government to ensure energy efficiency targets are pursued continuously.

Competition in the market

Benefits to energy consumers may ensue from introduction of technological innovation. Expenditure on research and development may yield greater benefits in cases where there are positive economies of scale to expenditure. In addition, the risk of promoting start-ups lessens when a Central Coordinating Body can adopt a portfolio approach to selecting innovative firms.

Design of a Central Coordinating Body would need to consider carefully the effect on the market of loss of competition between individual suppliers in the market for energy efficiency measures. There is potential for loss of competition in cases where contracts for installation of energy efficiency measures are awarded by a single rather than by suppliers acting individually.

Distributional Impacts

Government oversight of the overall targets and direction of an energy efficiency Central Coordinating Body could mean the government will ultimately have more control of the distributional impacts of the policy. The distributional impact of the fund will therefore largely depend on what measures the government decides they want to install in whose houses and where.

Decisions on targetting of different groups in different areas will affect the overall cost of the option as well as the distribution of costs and benefits. Increased targetting, whether by location or income grouping, generally increases the cost of delivering a certain carbon reduction for two

reasons. Firstly, search costs to find target households increase and secondly, target households may live in properties that are harder and thus more expensive to treat. The table below shows how the level of targetting increases the costs of a measures-based SO. In this example, increased targeting applies to the proportion of measures installed in priority group households. Moreover, targetting low income households may require a larger (or even a full cost) subsidy, with the result that the incremental rise fuel bills will be greater.

Scenario	*Total increased cost of the SO (£bn) over 9 years*
No obligation to install in priority group (PG) homes	0
Obligation to install 20% of measures in PG homes	0.6
Obligation to install 30% of measures in PG homes	1.8
Obligation to install 40% of measures in PG homes	2.1
Obligation to install 50% of measures in PG homes	2.8

However, there may be benefits that outweigh these costs. A Central Coordinating Body may be more effective at finding targetted households and hence incur lower search costs through partnership working with local authorities. However, the fund is unlikely to treat these households' homes more cost-effectively than suppliers or to do so with a lower subsidy. However, there may be an additional benefit where the fund could adopt an integrated approach to a entire neighbourhood rather than to dwellings in isolation. The "Green Streets" initiative is an example of the synergies achieved by an integrated approach.[7]

By determining the institutional design and corporate purpose of a Central Coordinating Body, the government will ultimately decide (and thus be responsible for) the distributional impacts of the policy. This way, it should be relatively easy for the government to determine recipients of energy efficiency measures.

4.4.2 Costs and Risks

There are learning costs associated with a Central Coordinating Body. Such an entity is an institutional innovation and thus has no track record in delivering the scale of carbon and energy savings needed over the next twenty years.

There may be uncertainties regarding the Central Coordinating Body's viability over the long term if contributions vary from year to year. Provisions would need to ensure stability and predictability of planning parameters. A further risk may arise if the Central Coordinating Body does not deliver as expected in which case accountability may be difficult to determine.

[7] Source: http://www.britishgas.co.uk/greenstreets

A further risk to consumer benefit may lie in the possibility that gains from centralised delivery are outweighed by losses in the degree of innovation generated by the process of competition in the market.

4.4.3 Benefits

A potential benefit of a Central Coordinating Body is the scope for strategic allocation of spending. In particular it may become easier to develop large scale energy efficiency projects that individual suppliers working in isolation may neglect, or to support technological innovation. Examples include CHP or District Heating. Government could also design the mandate of the Fund so as to help in the development of an ESCO market, in keeping with the commitment to change energy market structure.

Benefits ultimately will depend on the terms of reference of the Central Coordinating Body and in particular what the objectives of the Central Coordinating Body will be. For example, the entity's priority could be to reduce carbon at lowest cost or alternatively may be to reduce carbon in certain priority group households. The Central Coordinating Body would facilitate holistic refurbishment in the social sector, building on the Decent Homes Programme (and there may be potential for synergies with strategies developed under CESP). It should be noted that this form of targetting reduces benefits in terms of energy and carbon savings.

Consequently, more strategic decisions could be made with respect to how to implement energy efficiency measures in the UK taking into account the country's short and long term needs. Also, provisions could be made to integrate the Central Coordinating Body's information base with other government research.

The credibility of a Central Coordinating Body may facilitate changes in consumer behaviour due to the reputational advantage of an entity seen to be endorsed by Government. Furthermore, a Central Coordinating Body may be more efficient in gathering information about energy savings potential, an activity currently carried out by suppliers individually.

The effect on competition would be ambivalent and would depend on exact arrangements. On the one hand, monopoly provision eliminates the potential for market entry and creates scope for deadweight loss. On the other hand, a Central Coordinating Body would be in a position to contract out certain activities and by offering the prospect of larger volumes of business may encourage market entry by new firms. Thus, the potential of diminished competition at one level of the value chain may be outweighed by potential increases of competition at another level of the value chain. This would occur, for example, if the consolidation of funding for energy efficiency measures would enable the Central Coordinating Body to contract out obligations that are beyond the remit of suppliers acting in isolation, such as large scale CHP or District Heating.

Given the importance of behavioural barriers to implementing energy efficiency measures, the potential benefit from information by a not-for profit entity may be considerable. The National Audit Office has researched consumer response to advice proffered by the Carbon Trust and found that the business sector "appears to regard the Carbon Trust's arms-length relationship with the Department for Environment, Food and Rural Affairs as positive evidence of their independence and, therefore, that their advice is likely to be more objective." [8] Further

[8] National Audit Office: The Carbon Trust, 2007

investigation may demonstrate that central data gathering of consumer demand patterns, through means such as Smart Metering, may enable government to disseminate information and create innovative and credible mechanisms to achieve carbon savings. Use of information on energy patterns of households may enable targeting prospective energy efficiency measures.

A further benefit may ensue from positive economies of scale as information used by a Central Coordinating Body would be made available and put to effect across the country, thus reducing costs of information co-ordination and possibly achieving greater value for money than information gathered by individual suppliers.

5 Specific Impact Assessments

Impact on public spending

A measures-based Supplier Obligation will require expenditure from supply companies and there will be no impact on the overall level of public spending.

Establishment and activities of a Central Coordinating Body to be agreed.

Fuel Poverty Impact

CERT removes some 100,000 households from fuel poverty. The supplier obligation will maintain equivalent levels of effort. The exact impact on fuel poverty will depend largely on the price of energy in the period 2011-2020.

Competition Assessment

Supplier Obligation

Competition issues arise in two different markets – the market for energy supply and the market for energy/carbon saving measures. The supplier obligation does not create barriers to entry into the market for the supply of electricity or gas. However, since it is an obligation on suppliers, it does raise entry costs, although these costs may be passed through to consumers. The presence of costs of entry creates a barrier to the emergence of ESCO's.

Individual supplier obligations will be linked to customer numbers. The obligations will not be imposed on firms supplying less than 50,000 customers, so as not to deter new entry by small firms and to reflect the relatively higher costs incurred by small companies.
Suppliers are able to pass on the costs of their obligations. An inefficient supplier pursuing high-cost carbon reduction measures or raising prices to increase economic rent is likely to lose customers, who may switch to another supplier.

Suppliers have an incentive to keep the costs of their obligations low to minimise the amount of any pass through. This reflects the competitive supplier market and the drive to retain or acquire customers. Suppliers therefore have an incentive to be competitive in the supply of energy/carbon saving products and services. Barriers to entry into the market for most efficient energy/carbon saving products and services are relatively low.

Some suppliers may choose to take a large proportion of their obligations in-house, but there is no apparent reason why this will reduce competition in the energy supply market.

Central Coordinating Body

The impact on competition would depend on the actual design of delivery. Central co-ordination and delivery would have the advantages and benefits of monopoly provision. On the one hand, a monopoly could achieve positive economies of co-ordination and scale and reduce costs through bulk sourcing of raw materials and through centralised data gathering and processing. A monopoly may also be in a position to commit greater resources to promoting technological innovation. On the other hand, a monopoly would reduce the benefits of competition for consumers, when different suppliers seek to expand market share through cutting prices or introducing innovation in their services.

Small firms' impact test

Supplier Obligation

The SO proposals SO will not impose costs on small businesses. The draft Order does not apply to new and small energy suppliers with fewer than 50,000 customers. This means that new entrants would not have to set up CERT programmes while at an early stage. The draft Order contains other provisions that avoid the risk of creating barriers to new entrants: where a supplier prefers not to set up its own CERT programme, it may transfer all or part of its target to another supplier, purchase accredited performance from another supplier or contract out the operation of its programme.

In creating a demand for energy efficiency measures amongst the large energy supply companies there will be business opportunities for small firms in the insulation and energy efficiency industries that have benefited from the previous versions of the policy EEC 1, EEC 2 and CERT.

Short run bottlenecks may develop in the supply of certain products such as loft insulation or cavity wall insulation, given a projected rapid expansion of demand for these products. Any resulting price increases are likely to be short term, given possibility of new market entry. The indication in the 2006 Energy Review that there will be a supplier obligation from 2011 to at least 2020 could help induce new market entry.

Central Coordinating Body

The Central Coordinating Body's terms of reference could incorporate specific provisions to promote and favour small businesses, and could mandate steps to promote the development of ESCO's.

Race equality, gender equality and rural proofing

Under the post CERT supplier obligation, consumers benefit from measures regardless of race or gender. Consumers in both rural and urban areas will benefit.

Consultation

The Government has engaged with a wide range of stakeholders, including electricity and gas suppliers, representatives of energy efficiency industries, local authorities and other

representative bodies and organisations with an interest in energy efficiency, carbon reductions, fuel poverty and the environment.

The proposals in the consultation document take account of the comments received throughout the whole of the informal consultation process, particularly the initial consultation in summer 2006. They also take account of new information on the costs of carbon saving measures and other parameters that are likely to determine suppliers' costs in meeting their CERT obligations, including information about delivery of the current EEC.

Implementation and enforcement

The Regulator, Ofgem, will be responsible for the operation of the supplier obligation post CERT, including monitoring and enforcement. Ofgem's Administration Procedures will set out procedures for suppliers to achieve energy efficiency targets.

Monitoring and evaluation

Ofgem will report annually to the Secretary of State on progress on the supplier obligation post CERT and the Government will review the three-year programme in autumn 2011.

Delivery by a Central Coordinating Body would establish a management structure ensuring process compliance with Best Practice.

6 Summary

Our analysis suggests an "outcome based" supplier obligation may appear an attractive means of achieving carbon savings in the domestic sector. However, there would be a significant risk that a cap on energy suppliers would be met primarily through increased prices in a range estimated between £127 and over £2,000 p.a. per household bill, but without additional incentive on suppliers to install energy saving measures. Therefore, a cap based supplier obligation (outside the EU ETS) is not desirable from 2011.

Conversely, EEC and CERT have proved effective at ensuring that cost-effective energy efficiency measures are installed in households reducing both carbon emissions and energy costs. Our assessment of costs and benefits shows that an outcome based scheme could deliver benefits of around £6.8 billion (£10.9bn with avoided renewables) to the UK and add up to nearly £2100 on average consumers bills by 2020. By comparison, a measures based scheme would deliver benefits of around £27.83 billion (£39.6bn with avoided renewables) and put between £66 and £107 on average consumers bills by 2020.

Regarding delivery led by a Central Coordinating Body, our evaluation is at an early stage and our thinking on possible impacts is conceptual. Moving to a more stringent carbon constraint (e.g. consistent with a 30% EU emission reduction target by 2020) may be facilitated. by a new delivery model. With careful design, it could be more effective at co-ordinating energy efficiency investment and targeting the fuel poor than a supplier-led approach. The announced roll out of Smart Meters could facilitate a centralised approach (under certain scenarios).

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	*Results in Evidence Base?*	*Results annexed?*
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	No	No
Sustainable Development	Yes	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	No	No
Race Equality	Yes	No
Disability Equality	Yes	No
Gender Equality	Yes	No
Human Rights	Yes	No
Rural Proofing	Yes	No

Number of Energy Saving Measures installed in PG and Non PG households.

7 Annex A	9 year data set, April 2011-March 2020		
Carbon saving measure	**Number of measures**		
	PG	**Non-PG**	**Total**
Cavity wall insulation	500,000	3,500,000	4,000,000
Loft insulation (professional)	3,000,000	3,400,000	6,400,000
Loft insulation (DIY)	480,000	1,000,000	1,480,000
Glazing E to C rated	600,000	400,000	1,000,000
A/B rated boilers (exceptions)	0	0	0
Fuel Switching	311,000	311,000	622,000
Heating controls - upgrade with boiler	1,000,000	1,000,000	2,000,000
Heating controls - extra	600,000	800,000	1,400,000
CFLs - retail	0	0	0
CFLs - direct	0	0	0
Appliances - Cold A	0	0	0
Appliances - Wet A	0	0	0
Appliances - iDTVs	3,000,000	3,000,000	6,000,000
Tank insulation - top-up	0	0	0
Draughtproofing	0	0	0
Wood pellet stoves (secondary)	0	50	50
Wood pellet boilers (primary)	0	3,000	3,000
Photovoltaic panels (2.5 kWp)	0	3,000	3,000
Solar Water Heater (4m²)	100,000	100,000	200,000
micro Wind (1 kWp, 10% LF)	10	50	60
micro Hydro (0.7kWp, 50% LF)	0	50	50
Ground source heat pumps	26,000	34,000	60,000
SWI external	200,000	50,000	250,000
SWI internal	350,000	250,000	600,000
Air source heat pumps	300,000	300,000	600,000
Mini-wind 5 kW, 20% LF	200	200	400
Wood chip CHP	657	871	1,527
Community GSHP	50,000	50,000	100,000
Efficient halogens	3,000,000	50,000,000	53,000,000
Insulated wallpaper	40,000	10,000	50,000
Community heating to wood chip	11,200	5,200	16,400
Log burning stoves	50	50	100
mCHP (80% heat, 15% elec)	50	50	100
PC mains panels	3,000,000	3,000,000	6,000,000
Energy saving kettles	2,000,000	2,000,000	4,000,000
LNBs	250,000	250,000	500,000
Flue heat recovery device on standard boiler	1,000,000	1,000,000	2,000,000
Flue heat recovery device on combi boiler	1,000,000	1,000,000	2,000,000
Underfloor insulation	150,000	50,000	200,000
Parting wall insulation	0	0	0
Insulated doors	300,000	300,000	600,000
Fuel cells	0	0	0
Induction hobs	350,000	400,000	750,000
A rated ovens	350,000	400,000	750,000
A++ rated cold appliances	2,750,000	3,500,000	6,250,000
A+ rated wet appliances	1,000,000	1,000,000	2,000,000
LED lighting	0	0	0
Reduced standby	1,000,000	1,000,000	2,000,000
Efficient TV's (different from iDTV)	0	0	0
OLED computer screens	0	0	0

8 Annex B

Fuel Savings per year (real savings, ie net of comfort taking and deadweight) TWh/year

Year	Non-Traded sector (TWh/year)				Traded sector (TWh/year)
	Gas	Oil	Coal	Biomass	Electricity
2011	0	0	0	0	0.00
2012	3.29	0.32	0.47	-0.04	1.29
2013	6.57	0.64	0.94	-0.08	2.58
2014	9.86	0.96	1.41	-0.12	3.86
2015	13.15	1.28	1.88	-0.16	5.15
2016	16.44	1.60	2.35	-0.20	6.44
2017	19.72	1.92	2.82	-0.24	7.73
2018	23.01	2.24	3.29	-0.28	9.02
2019	26.30	2.56	3.77	-0.32	10.31
2020	29.59	2.88	4.24	-0.36	11.59
2021	29.59	2.88	4.24	-0.36	11.59
2022	29.59	2.88	4.24	-0.36	11.59
2023	29.59	2.88	4.24	-0.36	11.59
2024	29.59	2.88	4.24	-0.36	11.59
2025	29.59	2.88	4.24	-0.36	11.59
2026	29.59	2.88	4.24	-0.36	11.59
2027	29.59	2.88	4.24	-0.36	11.59
2028	29.59	2.88	4.24	-0.36	10.62
2029	29.59	2.88	4.24	-0.36	9.33
2030	29.59	2.88	4.24	-0.36	8.04
2031	29.59	2.88	4.24	-0.36	6.75
2032	29.59	2.88	4.24	-0.36	5.47
2033	29.59	2.88	4.24	-0.36	4.18
2034	29.59	2.88	3.82	-0.36	2.89
2035	29.59	2.88	3.35	-0.36	1.60
2036	29.59	2.88	2.87	-0.36	0.31
2037	29.59	2.88	2.40	-0.36	0.00
2038	29.59	2.88	1.93	-0.36	
2039	29.59	2.88	1.46	-0.36	
2040	29.59	2.88	0.99	-0.34	
2041	29.59	2.88	0.52	-0.30	
2042	29.59	2.88	0.05	-0.26	
2043	29.59	2.88	0	-0.22	
2044	29.59	2.88		-0.18	
2045	29.59	2.88		-0.14	
2046	29.59	2.88		-0.10	
2047	29.43	2.88		-0.05	
2048	26.14	2.56			
2049	22.86	2.24			
2050	19.57	2.09			
2051	16.28	1.77			
2052	12.99	1.45			
2053	9.71	1.13			
2054	6.42	0.81			
2055	3.13	0.49			
2056	0.00	0.17			
2057		0.00			
2058					