Department for
Business, Energy
& Industrial Strategy

ECO: HELP TO HEAT APRIL 2017 TO SEPTEMBER 2018

Final Stage Impact Assessment

January 2017

Title: Final Stage Impact Assessment: ECO: Help to Heat - April 2017 to September 2018 **IA No:** BEIS029(F)-16-HL **RPC Reference No:** RPC16-DECC-3351(2) **Lead department or agency:** Department for Business, Energy and Industrial Strategy **Other departments or agencies:** None	**Impact Assessment (IA)** **Date:** January 2017 **Stage:** Final **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** *BeisECOteam@beis.gov.uk*

Summary: Intervention and Options

RPC Opinion: GREEN

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANDCB in 2014 prices)	**In Scope of One-In, Three-Out?**	**Business Impact Target Status** Measure qualifies as
£638m	-£888m	£576m	Yes	Qualifying Provision

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

Upgrading the energy efficiency of homes addresses the root cause of fuel poverty, reduces greenhouse gas emissions, lowers energy bills, and improves security of energy supply. A number of market barriers and failures exist in the energy efficiency market, preventing the deployment of energy efficiency in the absence of Government intervention. They include externalities, imperfect information and information asymmetries, lack of access to capital, and misaligned incentives. Government intervention is required to overcome these barriers to deliver on its fuel poverty and climate change commitments.

What are the policy objectives and the intended effects?

The policy is intended to drive uptake of energy efficiency measures in the residential sector that would not have occurred in the absence of intervention, in particular among households in or at risk of fuel poverty. The intended effects are to: make progress against Government's statutory fuel poverty and climate change commitments; reduce energy demand in the residential sector, thereby lowering energy bills and improving energy security; improve thermal comfort and subsequent health outcomes; support jobs and growth.

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

The Government's final position is to extend the current ECO obligation by 18 months with a greater focus on tackling fuel poverty and supporting households on lower incomes. The extension will see an increase in the size of the Affordable Warmth (AW) obligation that focuses on lower income and fuel poor households, a relative reduction in the size of the Carbon Emissions Reduction Obligation (CERO), and the removal the Carbon Saving Communities Obligation (CSCO).

The policy will also:

- Extend the current solid wall minimum requirement (at a reduced level), with suppliers required to insulate the equivalent of around 32,000 additional solid walled homes (21,000 per year);
- Cap the number of qualifying gas boiler replacements delivered at the equivalent of just over 37,000 (25,000 per year) ;
- Reduce the administrative burden to suppliers and the supply chain, principally through simplified scoring, and the removal of the recommended measures reports under CERO.

Will the policy be reviewed? It will be reviewed. **If applicable, set review date:** 10/2022

Does implementation go beyond minimum EU requirements?		N/A		
Are any of these organisations in scope?	**Micro** No	**Small** No	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** -1.2	**Non-traded:** -7.7	

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 minster: Jesse Norman Date: 24/01/2017

Summary: Analysis & Evidence — Final Government Position

Description: The Energy Company Obligation is extended by 18 months, with an increased focus on the Affordable Warmth Obligation (AW); reduced focus on the Carbon Emissions Reduction Obligation (CERO); and removing the Carbon Saving Communities Obligation (CSCO).

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2016	Time Period Years 44	Net Benefit (Present Value (PV)) (£m)		
			Low: Optional	High: Optional	Best Estimate: £638m

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				**£788m**

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

The largest societal costs are the material and labour costs associated with installation of energy efficiency measures (PV, £669m), costs of ECO scheme administration to suppliers (PV, £114m), the hidden costs associated with the installation of energy efficiency measures (PV, £70m), the avoided costs of replacement boilers (PV, -£144m), and the search, finance and operational costs (PV, £79m). The vast majority of these costs are expected to be incurred by energy suppliers.

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

There will be some small costs to BEIS and the administrator, which have not been monetised.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		Optional	**Optional**
High	Optional		Optional	**Optional**
Best Estimate				**£1,427m**

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

Households that have energy efficiency measures installed are the main affected group. They will benefit from energy savings (PV £730m), and increased comfort from warmer homes (PV, £182m). Society will also benefit from improved air quality (PV £62m), and reduced traded (PV £13m) and non-traded (PV £440m) greenhouse gas emissions.

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

The UK is likely to benefit from lower energy imports, and lower costs of meeting peak energy demand. Health impacts associated with the improved energy efficiency of properties treated under ECO have been estimated at PV £158m. This benefit has not been included in the cost benefit analysis due to potential overlap with comfort taking.

Key assumptions/sensitivities/risks — **Discount rate (%)** 3.5 (years 1-30), 3.0 (>30 years)

The targets set in legislation will require suppliers to deliver a set volume of carbon savings and notional bill savings by installing energy efficiency measures. The precise cost to suppliers, and therefore the pass through of these costs onto energy bills, is uncertain.

When partial estimates of the distributional benefits of the Government's final position are included, the net present value increases to £1,474m (an increase of 131%).

BUSINESS ASSESSMENT (Final Policy Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs:	Benefits:	Net:	
£576m	£0	£576m	-£3,041m

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1. Introduction

1. This final stage Impact Assessment (IA) accompanies the Government response on extending the Energy Company Obligation, with a greater focus on supporting lower income and fuel poor households. It applies across Great Britain.

2. The aim of this document is to provide the Government's assessment of the main impacts of the extension which runs between April 2017 and September 2018.

2. Problem under Consideration

3. The housing stock is responsible for a significant share of the UK's non traded[1] carbon emissions (around 25%)[2], and primary energy consumption (around 27%)[3]. Tackling the poor energy efficiency of the housing stock is therefore important in meeting the Government's legally-binding carbon targets. Upgrading the energy efficiency of homes is also the most sustainable means of tackling fuel poverty. Fuel poor households in England are disproportionately concentrated in the least energy efficient homes - more than 40% of fuel poor households live in homes rated Band E or below, compared to just half that among the wider housing stock. The Government has a statutory target to raise as many fuel poor homes in England as reasonably practicable to energy efficiency Band C by 2030[4], with interim milestones of as many fuel poor homes in England as reasonably practicable to Band E by 2020 and Band D by 2025[5].

4. Tackling the poor energy efficiency of the housing stock is also likely to lead to wider benefits, including:

- **Help lower household energy bills** - Households can save between £30 and £300 a year off their energy bills if they insulate their homes[6]
- **Reduce the costs of meeting energy demand** - International evidence suggests that energy efficiency can, in many cases, have a lower capital outlay and a lower levelised cost[7] than any form of fossil fuel or renewable generation[8]
- **Improve the security of energy supply** - The International Energy Agency (IEA) estimate that since 1990, energy efficiency improvements have reduced the UK's energy imports by around 25 million tonnes of oil equivalent, and reduced the UK's import bill by around $7 billion[9].
- **Improve health outcomes and reduce costs to the public of providing health care** - Living in accommodation that is not adequately heated can lead to a range of physical and mental health conditions, from cardiovascular disease in elderly householders to asthma in children[10].

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[1] Emissions from electricity are covered by the EU Emissions Trading System (EU ETS), and are known as 'traded emissions'.
[2] DECC Energy and Emission Projections (2015):
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/501292/eepReport2015_160205.pdf
[3] See domestic sector final consumption
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450302/DUKES_2015.pdf
[4] More detail on measuring fuel poverty in England, the statutory target, and fuel poverty strategy for England see:
https://www.gov.uk/government/publications/cutting-the-cost-of-keeping-warm
[5] It is important to note that in relation to the fuel poverty target for England, energy efficiency is defined by the Fuel Poverty Energy Efficiency Rating (FPEER), which is a variation on the EPC. More detail can be found here:
https://www.gov.uk/government/publications/fuel-poverty-england-regulations-2014-and-methodology
[6] DECC Prices and Bills Report (2014), p. 7:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/384404/Prices__Bills_report_2014.pdf
[7] The levelised cost of energy is an attempt to measure different forms of generation on a comparable basis.
[8] International Energy Agency, Energy Efficiency Market Report (2015)
http://www.iea.org/publications/freepublications/publication/MediumTermEnergyefficiencyMarketReport2015.pdf
[9] International Energy Agency, Energy Efficiency Market Report (2015)
http://www.iea.org/publications/freepublications/publication/MediumTermEnergyefficiencyMarketReport2015.pdf
[10] For more detail see Chapter 3 of the Hills Fuel Poverty Review Interim Report:
http://eprints.lse.ac.uk/39270/1/CASEreport69%28lsero%29.pdf

- **Support economic growth and jobs** - Reducing domestic energy bills will increase the disposable income of households, which could lead to higher economic growth by maintaining thermal comfort from energy while supporting increased spending on other goods and services[11].

3. Rationale for Government Intervention

3.1 Market barriers and failures

5. Market barriers and failures exist in the energy efficiency market, preventing the deployment of energy efficiency in the absence of government intervention. These have been extensively detailed in past ECO impact assessments and related documents[12]. To recap, the key market barriers and failures for intervention in the domestic energy efficiency market are:

- **Access to capital** - the upfront cost of energy efficiency measures means households must choose between investing in them or using the same money for other purposes (the 'opportunity cost').

- **Incomplete or asymmetric information** - the energy efficiency market is characterised by a lack of trusted information for consumers who are not well informed about the potential savings from the installation of energy efficiency measures.

- **Misaligned incentives** - for significant sections of the housing stock, the party responsible for the property may not be the same as those living in it. This can lead to underinvestment in energy efficiency measures, because the former would be responsible for funding them while the latter would experience the benefits of lower bills and improved thermal comfort.

- **Externalities** - households generate carbon emissions through using energy in the home (e.g. heating). They experience the benefit of doing so (e.g. a warm home), but the climate change costs resulting from the emissions are under-priced.[13] This leads to overconsumption of energy and low demand for energy efficiency because the costs and benefits to society of energy use are not aligned.

3.2 Equity Considerations

6. Intervention is also justified on the grounds of equity by tackling fuel poverty and improving health.

- **Fuel poverty**[14] - Energy is a necessity and the fuel poor are among those with the highest needs (usually driven by poor energy efficiency) despite being on lower incomes. However, most of these households lack the means to fund energy efficiency improvements to tackle the underlying problem[15]

[11] Particularly amongst households with lower household disposable income, as these households are likely to spend a greater proportion of their income on essentials (and therefore have a higher marginal propensity to spend any increases in their disposable income).
[12] See the 2014 ECO IA https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373650/ECO_IA_with_SoS_e-sigf_v2.pdf and 2012 IA https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf
[13] The exception here would be electrically-heated homes, as electricity generation is subject to the EU Emissions Trading System which places a price on carbon emissions generated.
[14] Households in England are considered to be in fuel poverty if they face above average energy costs and if they met those costs would be left with a residual income below the poverty line. In Scotland and Wales households are considered fuel poor if they need to spend more than 10% of their income on household energy
[15] Fuel Poverty Statistics (2016), available at: https://www.gov.uk/government/collections/fuel-poverty-statistics

- **Health outcomes** - Living at low temperatures poses a risk to health, with a range of negative morbidity and mortality impacts associated with exposure to the cold. The Marmot Review Team report on cold homes and health[16], in addition to the Hills Fuel Poverty Review[17], set out the strong body of evidence linking low temperatures to these poor health outcomes.

4. Policy Objectives

4.1 Main policy objectives

7. The policy proposal will seek to put lower income and fuel poor consumers at the heart of a new framework for delivery of energy efficiency measures. Key outcomes are to extend the current regulatory framework, amending to put vulnerable consumers first and improve the efficiency of the scheme by:

- Focusing more of the obligation on those most in need;
- Controlling costs and getting better value for money;
- Simplifying and removing complexity;
- Giving long term certainty to support investment;
- Working with local actors; and
- Aligning the policy approach with long-term strategy around carbon budgets and tackling fuel poverty.

5. Policy Options

5.1 Policy Option 0 – the 'Do Nothing' option

8. Under this option, ECO ends in March 2017 and obligated energy companies are no longer required to deliver heating and insulation measures to homes. Only a small number of energy efficiency measures are estimated to be installed in the absence of Government intervention (due to the market barriers and failures outlined above).

9. This option represents the counterfactual against which the costs and benefits of the Government's final position are assessed (more details on the counterfactual can be found in Section 7).

5.2 Policy Option 1 - the Government's Final Position

10. The Government's final position broadly mirrors the proposals set out in the consultation[18]. It involves increasing the element of the scheme that focuses on fuel poor and low income households, while retaining a carbon focussed element of the present ECO scheme.

11. The main departures from the consultation proposals (outlined in more detail in the Government Response) are outlined in the table below, followed by the final targets set in legislation.

5.3 Key changes from the consultation proposals

Table 1: Key changes to the policy design from those outlined in the consultation

[16] Marmot Review Team (2011). *The Health Impacts of Cold Homes and Fuel Poverty*. Available at: http://www.instituteofhealthequity.org/projects/the-health-impacts-of-cold-homes-and-fuel-poverty
[17] Hills (2011). *Fuel Poverty: The Problem and Its Measurement*. Available at: http://eprints.lse.ac.uk/39270/1/CASEreport69%28lsero%29.pdf
[18] The consultation and accompanying IA can be found here: https://www.gov.uk/government/consultations/energy-company-obligation-eco-help-to-heat

Change from Consultation	Description and type of change	Reason for change
Length of Extension	The extension period has been increased from 12 to 18 months	Consultee feedback: given the scale of the change required a longer extension period was considered appropriate
Solid Wall Minimum	The solid wall minimum has been increased from around 17,000 per year to around 21,000 per year	Consultee feedback and updated evidence on the costs to suppliers of delivering solid wall insulation
Rural Safeguard in CERO	A least 15% of CERO must be delivered to rural locations (i.e. settlements with fewer than 10,000 inhabitatants)	Safeguard delivery to rural areas.

5.4 Targets for obligated suppliers

12. The final targets for the extension period are:

- The Carbon Emissions Reduction Obligation (CERO)[19] target is increased by 7.3MtCO_2 (to 19.7MtCO_2) by end of September 2018 (15%, or around 1.1 MtCO_2, of which must be delivered to rural areas);
- The Carbon Saving Communities Obligation (CSCO)[20] target will not be increased. This will in effect mean a removal of CSCO for the extension.
- The Affordable Warmth (AW)[21] target is increased by £2.76bn (to £6.46bn) of lifetime notional bill savings by end of September 2018.

13. The policy will also:

- Set a solid wall insulation (SWI) minimum: 1.40 MtCO2 (broadly equivalent to 32,000 SWI)
- Limit on qualifying gas boilers: £0.66bn notional lifetime bill savings (broadly equivalent to just over 37,000 boilers and 24% of the overall Affordable Warmth Target)
- Increase eligility under Affordable Warmth: Eligible pool of 4.7m households (compared to 3m at present and 4m in the consultation); equivalised income for tax credit and universal credit recipients; E, F or G-rated social housing included.

14. More information on the rationale for the final policy position can be found in Annex A.

6. Analytical approach

6.1 Appraisal period

15. The policy is appraised over the period 2016 to 2059, an appraisal period of 44 years. This reflects the lifetime of the energy efficiency measures that are expected to be installed during

[19]CERO seeks to reduce lifetime carbon emissions through the deployment of insulation measures where they can be delivered most cost-effectively

[20] CSCO again seeks to reduce lifetime carbon through mainly insulation measures, with delivery restricted to the lowest scoring 25% Lower Layer Super Output Areas or Data Zones of Great Britain according to the Index of Multiple Deprivation (more information on the eligible areas for CSCO can be found here: https://www.ofgem.gov.uk/publications-and-updates/csco-tool)

[21]Affordable Warmth looks to reduce lifetime notional heating costs (which are the estimated costs of space and water heating costs according to the Standard Assessment Procedure (SAP) – Government's official measure of the energy performance of domestic buildings) in low income and vulnerable households in or at risk of fuel poverty, through a mixture of insulation and efficient heating systems.

the extension, the longest-lived of which (cavity wall and loft insulation) are estimated to last for 42 years[22].

6.2 Improvements to the evidence base

16. The key improvements to the evidence base are outlined in the table below. More detail can be found in Annex B.

Table 2: Key improvements to the evidence base since the consultation

Change from Consultation Stage IA	Description and type of change	Reason for change
Potential to deliver insulation	There has been an upward revision to the remaining loft, cavity and solid wall technical potential	Improved evidence base
Measure scoring	The consultation stage IA used provisional deemed scores. Since then, the final set of deemed scores has been published, and these have been incorporated into the modelling	Final scores for the scheme have now been published by Ofgem, to which Government will apply an uplift
Insulation installation costs and cavity wall classification	Revised cost assumptions for loft, cavity and solid wall insulation	Consultee feedback, improved evidence base
Third party funding	Third party funding has been incorporated into the modelling	Consultee feedback, improved evidence base

7. Counterfactual

7.1 Uptake in the absence of Government intervention

17. A relatively small amount of insulation uptake may still be expected in the absence of the ECO policy[23]. The exact level of uptake will depend on factors such as measure costs, technological improvements, and customer awareness, which are inherently uncertain. However, as the scheme is targeted primarily at a combination of measures and households where energy efficiency may be less likely to improve in the absence of Government intervention, we expect this uptake to be relatively small.

18. The National Household Model was used to simulate the uptake of insulation in the counterfactual.[24] We estimate that around 51,000 insulation measures would be installed between April 2017 and September 2018 in the absence of Government intervention. This is considerably lower than uptake seen over the ECO period to date, which has averaged around 500,000 insulation measures per annum since the scheme's inception in January 2013.

19. The PRS Regulations require landlords to make energy efficiency improvements, meaning some energy efficiency improvements would occur in the private rented sector in the absence of the ECO extension. However, the number that are expected to act early (before the minimum

[22] With measures deployed during the extension, the appraisal period would therefore need to run to 2059 (42 years after the extension) in order to ensure that all of the energy saving-related benefits from these long lived measures are captured. This approach of ensuring that the benefits are captured over the full lifetime of the measures is in line with Green Book Guidance.
[23] Office of Fair Trading's (OFT) 2012 report on home insulation concluded that insulation measures in existing buildings were "strongly driven" by government targets and schemes: http://webarchive.nationalarchives.gov.uk/20140402142426/http://www.oft.gov.uk/shared_oft/markets-work/energy-efficiency/oft1433.pdf
[24] This has been determined by setting the subsidy level on offer to households within the model to zero.

standards come into force from April 2018) or within the first six months of the minimum standards coming into force is expected to be small.[25]

8. Categories of Costs and Benefits

20. Table 3 below summarises the key costs and benefits included in this IA. More details on each component used in the cost benefit and distributional analysis can be found in Annex F, while more details on the justice impact and potential impacts of flexible eligibility can be found in Annex I.

Table 3: Summary of key costs and benefits

Group	Costs	Benefits
Costs and Benefits included in the Cost – Benefit Analysis (monetised)	Energy efficiency measure installation costs	Societal energy savings
	Hidden costs associated with installing measures	Carbon savings
	Heating measure ongoing operational costs	Air quality improvements
	Supplier administration costs	Comfort taking (the benefit of a warmer home)
	Additional supplier search costs under Affordable Warmth	
	Natural boiler replacement cost savings (negative costs)	
Distributional costs and benefits (included in the distributional analysis)	Supplier delivery costs (including economic rent)	Value to society of lower energy bills in low income households
	Consumer bill impacts	Improved health outcomes
	Household contributions	Improvement in fuel poverty (not monetised)
Non modelled/ non monetised impacts	Justice impact (no significant impact on the justice system expected)	Flexible eligibility (may reduce supplier delivery costs)
		Increase in business as a result of increased demand for measures
		Brand recognition from engaging households with offer of support
		Improvement in security of energy supply
		Wider economic benefits, for example supporting the energy efficiency supply chain, creating green jobs
		Community impacts
		Resource savings from replacement boilers at scale
		Reduction in energy system costs

[25] The minimum standards may also influence the tenure of homes treated during the ECO extension (that is, all else being equal they may increase the proportion of privately rented properties treated during the ECO extension). However, with a relatively small number of landlords expected to act within the first six months of the Regulations coming into force, this effect is expected to be relatively small. The extent to which the PRS Regulations will drive additional PRS uptake under the ECO extension will also depend on the relative cost effectiveness of the properties brought forward, as well as the tenant's eligibility (should the landlord seeks ECO funding through Affordable Warmth).

9. Impact Analysis

9.1 Costs and benefits

21. The overall monetised costs and benefits of the policy options to society, net of the counterfactual and discounted to 2016, are shown in Table 4.

Table 4: Aggregate costs and benefits of the ECO Extension, 2017 – 2059 (2015 prices)

Description of costs and benefits	Present Value, £m unless otherwise stated ECO April 2017 – September 2018
Installation costs	669
Hidden costs	70
Finance costs	16
Supplier administration costs	114
Boiler warranties	5
Search costs (Affordable Warmth)	45
Operational costs	13
Natural boiler replacement costs[26]	*-144*
Total Costs	**788**
Value of energy saved	730
Value of air quality improvements	62
Value of change in traded carbon savings	13
Value of change in non-traded carbon savings	440
Value of comfort taking	182
Total Benefits	**1,427**
Overall Net Present Value	***638***

22. The installation costs of the energy efficiency measures, which do not include any 'excess subsidy' or economic rent (as this is a transfer), represent the largest societal cost from the extension at £669m, followed by supplier administration costs at £114m. The largest benefit, meanwhile, is the value of energy savings at £730m.

23. Combining the costs and benefits shows that the overall net benefit of the ECO extension is around £638m. This represents an increase of over 250% compared to the net present value presented in the consultation stage IA, which is in part due to the 18 month extension of the policy (rather than 12), and the higher volume of measures delivered for the same level of supplier spend (a result of greater third party funding assumptions and lower measure cost assumptions).

24. Table 5 shows the same costs and benefits as in Table 4, but after applying equity weights to the appropriate components. This reflects the distributional impacts of the scheme, consistent with the Green Book guidance[27] (see Annex C, pages 84-86, of the consultation stage IA for more information on the equity weights).

[26] Natural boiler replacement costs enter Table 4 as a negative cost. This reflects that as replacement boilers are deployed under Affordable Warmth (which are accounted for under the installation costs), an equivalent number of boilers no longer need to be replaced by the householders themselves (this leads to a net impact of reduced resource costs because of economies of scale achieved through the bulk buying of boilers under the ECO scheme. Under the counterfactual householders would have paid a higher price for a replacement boiler at a later date). The size of the large negative value (-£144m) is driven by the delivery of just over 37,000 gas boilers, and around 8,000 oil boilers (the latter of which tend to be more expensive and therefore lead to the large negative value shown).

Table 5: Equity-weighted costs and benefits, 2017 - 2059 (2015 prices)

Description of costs and benefits	Present Value, £m unless otherwise stated ECO April 2017 – September 2018
Installation costs (*including cost of economic rents*)	1,161
Hidden costs	70
Finance costs	19
Supplier administration costs	141
Boiler warranties	7
Search costs (Affordable Warmth)	56
Operational costs	23
Natural boiler replacement costs	*-307*
Customer contributions towards installation costs	3
Total Costs	**1,173**
Value of energy saved	730
Value of air quality improvements	62
Value of change in traded carbon savings	13
Value of change in non-traded carbon savings	440
Value of comfort taking	277
Extra utility from lower bills in low income households	*578*
Value of economic rent to low income households	*547*
Total Benefits	**2,647**
Equity-weighted Net Present Value	***1,474***
Proportional change in NPV from equity weighting	*+131%*

25. The equity weighting tends to increase both the costs and benefits of the policy outlined in Table 5[28], but with a more significant increase in benefits. This is because the majority of the costs are paid for by all energy consumers, who are relatively evenly distributed across income groups; but the benefits are focused on lower income households. For lower income households the value of each pound spent or saved is valued more highly from a social perspective, because £1 of cost or benefit is worth more to households on a lower income than to those on a higher income.

9.2 Annual costs to suppliers

26. The social impacts of the policy shown above are not expected to be shared equally across society, with obligated suppliers expected to incur most of the costs presented in Table 4. Suppliers are in turn assumed to recoup the costs they incur from their gas and electricity customers.

27. Table 6 below shows suppliers' costs broken down by obligation during the extension, and how these compare to the annual supplier costs expected to be incurred under the final 2 years of the current scheme between April 2015 and March 2017.[29]

[28] Equity-weighting is an approach outlined in the Green Book to monetise the distributional costs and benefits of policy options. It allows us to reflect that £1 of cost or benefit is worth more to those on lower disposable incomes than those in higher income groups.

[29] These costs are slightly higher than those presented in the final stage Future of ECO Impact Assessment (£820m), as they have been adjusted for inflation using HMT GDP deflators to convert them from 2013 to 2015 prices, making them consistent with other costs presented in this IA.

28. The administration costs fall slightly during the extension compared to the current scheme. This reflects the scheme simplifications outlined in Section 5, resulting in around £5m per annum of admin cost saving according to a survey of the larger obligated suppliers undertaken by the Department in early 2016.

Table 6: Supplier Costs during the ECO Extension (real 2015 prices, undiscounted)

Cost Component	Cost (£m per annum, Final Government Position)	*Costs (£m) per annum under current ECO*
CERO Delivery Costs	£160m	*£260m*
CSCO Delivery Costs	£0m	*£230m*
AW Delivery Costs	£380m	*£270m*
Administration	£80m	*£85m*
Total Costs	**£620m**	***£840m***

29. Table 7, below, presents the cost per lifetime tonne of carbon saved and notional lifetime saving (LTS) in fuel costs under CERO and AW and how these compare to delivery costs at present. It shows that the CERO carbon price is over a third lower than in the consultation stage IA. This largely reflects the reduction in the assumed solid wall insulation capital costs and an increase in third party contributions (see Annex B for more information).

Table 7: Cost per tonne of carbon and notional lifetime savings in fuel costs (2015 prices)

Cost Component	Costs during 2015/16	Consultation Stage IA	Final Stage IA (with deemed scores uplift)
CERO – Solid Wall	*Not available*	*£106/tonne*	*£55/tonne*
CERO – Non Solid Wall	*Not available*	*£29/tonne*	*£28/ tonne*
CERO – Average	***£32/tonne***	***£53/tonne***	***£33/tonne***
AW – Qualifying Gas Boilers	*Not available*	*NA*[30]	*12p/LTS*
AW – Other measures	*Not available*	*NA*	*23p/LTS*
AW – Average	***10-12p/LTS***	***20p/LTS***	***20p/LTS***

30. The CERO costs, however, are slightly higher overall than those observed during 2015/16. This reflects:

- Slightly lower cost effectiveness amongst the remaining technical potential compared to homes being treated at present.
- Slightly lower levels of third party funding are assumed to be available during the extension, as schemes such as Green Deal Communities (which can be leveraged with ECO) have come to an end.

31. The increase in costs under Affordable Warmth compared to 2015/16, meanwhile, reflects:

- The cap on qualifying gas boiler replacements. This measure makes up over 90% of delivery under Affordable Warmth at present, but has been capped during the extension (as the table shows, we expect qualifying gas boiler replacements delivered during the extension – up to the cap – to be delivered at around the same cost (12p/LTS) as the average seen over the past year.
- Suppliers having greater difficulty finding amenable households than at present (households are generally more amenable to installing new boilers than insulation), which is expected to drive up the delivery costs.

[30] The AW model now segments qualifying gas boilers from other types of delivery, reflecting the fact that, like solid wall insulation, the cap artificially constrains what would have been delivered in its absence.

32. For both obligations, greater supplier demand than at present (where suppliers are well on course to meet their targets) is also expected to drive up costs[31].

9.3 Measure Uptake

33. Table 8 shows modelled gross measure uptake during the 18 month extension. The most frequently installed measures are loft insulation (over 230,000) and cavity wall insulation (around 250,000). The qualifying mains-gas boiler replacement limit of 25,000 per year (or just over 37,000 across the full 18 months) is estimated to be reached, and in addition 8,000 qualifying oil boiler replacements are delivered. Around 4,000 first time central heating systems are also installed.

Table 8: Modelled uptake of energy efficiency measures by obligation, April 2017 – Sept 2018

	Affordable Warmth	CERO	Total
Low Cost Cavity Wall Insulation	101,000	149,000	250,000
High Cost Cavity Wall Insulation	3,000	15,000	18,000
Loft insulation	148,000	85,000	233,000
Solid wall insulation - external	3,000	28,000	32,000
Qualifying gas boiler replacements	37,000	-	37,000
Qualifying oil boiler replacements	8,000	-	8,000
First time central heating	4,000	-	4,000
Heating controls	6,000	-	6,000
Total measures	**311,000**	**278,000**	**588,000**

9.4 Homes Treated

34. The number of homes treated under ECO 2 (April 2015 – March 2018) and the ECO extension are shown in the table below. The carrying over of ECO 1 'excess actions' into ECO 2 reduces the number of homes that need to be treated under ECO 2, meaning we now estimate that just over 500,000 homes will be treated. If we consider only the homes that are insulated this figure reduces to just over 360,000, as the majority of homes treated under Affordable Warmth are expected to receive replacement boilers or heating controls, rather than insulation[32].

35. In addition, we estimate that around 500,000 homes will be insulated during the 18-month ECO extension.

Table 9: Estimated number of homes treated and insulated under the current ECO and the extension (April 2015 – September 2018)

Number of Homes Insulated / Treated	AW	CERO	Total
Homes Insulated			
April 15 – March 17 (Current ECO)	20,000	345,000	365,000
April 17 – September 18 (ECO Extension)	255,000	245,000	500,000
Total April 2015 - September 2018	**275,000**	**590,000**	**865,000**
Number of Homes Treated			
April 15 – March 17 (Current ECO)	175,000	345,000	520,000
April 17 – September 18 (ECO Extension)	300,000	245,000	545,000
Total April 2015 - September 2018	**475,000**	**585,000**	**1,065,000**

[31] This is reflected in the modelling as an increase in economic rent.
[32] Household Energy Efficiency Statistics show that around 98% of measures installed within Affordable Warmth in the year to September 2015 were heating rather than insulation measures.

9.5 Health Impacts

36. As outlined in Section 3, making energy efficiency improvements in homes can improve the health of the occupants, for example by reducing their risk of cardiovascular and respiratory diseases from warmer internal temperatures.

37. We have monetised the health benefits associated with making these energy efficiency improvements under the extension using BEIS's Health Impacts of Domestic Energy Efficiency Measures (HIDEEM) model (more details on this model can be found in Annex G, page 99, of the consultation stage IA).

38. Table 10 presents the estimated impacts during the extension. Overall, the monetised health benefits are expected to be £158m, with installation of cavity and loft insulation making up the majority of these benefits[33].

Table 10: Health Benefits (April 2017 – Sept 2018)

Present Value, £m	Final Government Position
Cavity wall Insulation	90
Loft Insulation	60
Solid Wall Insulation	8
Boiler upgrades	0.5
First time central heating	0.2
Total	**158**

9.6 Supplier Administrative costs

39. As discussed in greater detail in the Government response, the ECO extension includes provisions designed to reduce administrative costs under the new supplier obligation. In order to assess the impact of simplifying the administration regime, we asked suppliers to complete a short survey detailing their overall ECO administration costs, and how those items might be affected by streamlining the scheme.

40. Responses were received from all obligated suppliers and, on aggregate, indicated that suppliers expected the simplifications would reduce their administration costs by around 7.5% on average. This reduction would represent a decline in administrative costs of around £5m per year during the extension, taking the administration costs to around £80m per year. These are reflected in the supplier delivery costs outlined in Section 9.2 above.

41. Administration costs associated with ECO are not limited to suppliers. Suppliers often procure ECO compliance through third parties (rather than through integrated delivery arms) – for example through installer companies, managing agents or Green Deal Providers on the ECO brokerage platform. Under these circumstances, many of the administration costs will be incurred within the supply chain, and would therefore appear as supplier delivery costs rather than administration when reported to BEIS.

42. In line with the provisions in the consultation, we have also removed the costs associated with Green Deal Advice Reports (GDAR) from our CERO modelling assumptions, which is also expected to reduce some of the supply chain's administration costs. Table 8 shows that we

[33] There are potential overlaps with the comfort taking benefits included in the net present values set out in Section 9.1; therefore we do not include the monetised health impacts in the cost-benefit analysis. At present we are not able to quantify the potential savings to health provision services (such as the NHS) from improving the energy efficiency of homes, although we expect these in reality to potentially be significant.

estimate around 278,000 measures to be delivered under CERO, and with GDARs costing an estimated £180 per measure installed[34], this would save up to £50m (or lead to a reduction in delivery costs of around 20%) compared to the current scheme. These savings do not appear as reduced admin savings, however, as they are assumed to be recycled into additional installations under the extension.

43. It is possible that some of the GDAR costs are incurred by suppliers rather than the supply chain, meaning that the reduction in supplier admin costs may lead to a small amount of double counting of the savings. Anecdotal evidence suggests that GDAR costs are mostly incurred in the supply chain, however, suggesting that double counting within the £5m per year supplier admin savings is likely to be limited.

44. Further, the final Government position includes other provisions expected to save on administration costs in the supply chain that we have not been able to capture. It is difficult, however, to determine these additional supply chain cost savings as suppliers do not have sufficient visibility on the supply chain administration costs.

9.7 Fuel Poverty Impact

45. Table 11 shows progress towards the fuel poverty target and milestones, alongside the latest fuel poverty statistics for England (2014) [35], to demonstrate the cumulative progress since the start of the ECO until the end of the extension.

46. The table shows that by the end of the extension, the proportion of fuel poor homes at Band E or above is estimated to be around 92% - up from 88% in 2014. Due to modelling and data limitations it has not been possible to undertake equivalent estimates for Scotland or Wales, although we would anticipate the direction of travel to be similar to that in England.

Table 11: Estimated impact of extension on fuel poverty (England only), 2018

	Latest Fuel Poverty Statistics (2014)	Final Government Position (2018)
% of fuel poor households at Band E or above	88%	92%
% of fuel poor households at Band D or above	59%	68%
% of fuel poor households at Band C or above	7%	13%

9.8 Carbon Savings

47. Table 12 shows the traded and non-traded carbon savings[36] under the final policy[37]. Traded savings decline over time as the impact of replacement boilers and first time central heating

[34] This assumes 3 GDARs required per successful installation, with the first 2 not leading to a measure being installed.
[35]The changes in the headline fuel poverty indicators (number of households in fuel poverty and the fuel poverty gap) as a direct result of the ECO extension are difficult to estimate, particularly as the fuel poverty gap is sensitive to energy prices, and the counterfactual includes suppliers reducing their prices as a result of no longer having to fund ECO measures, and there is uncertainty about the timing of this reduction given there are a range of factors that determine when suppliers change their prices. We therefore do not estimate the headline fuel poverty estimates here, but will seek to do so for the 3.5-year successor scheme to ECO from 2018.
[36] Savings presented do not adjust for counterfactual measure uptake, except where there are overlaps with other policies. This is to avoid double counting of carbon savings across policies (for example, savings from boilers are adjusted to avoid double counting of carbon savings with Building Regulations).
[37] An updated assessment of the impact of policies on carbon emissions will be published in the 2016 Energy and Emissions Projections (EEP). The EEP estimate impacts could differ from the ones presented here because of potential differences in final energy use and emissions factor assumptions underpinning the forthcoming projections.

(which are assumed to have net lifetimes of up to 3 years, and 12 years respectively) tails off[38]. Insulation measures, which predominantly save non-traded fuels such as gas, are estimated to have lifetimes beyond 35 years and therefore continue to make savings beyond CB5.

Table 12: Estimated greenhouse gas savings, by obligation and carbon budget (CB) period

MtCO2e	CB 3 (Traded)	CB 3 (Non-Traded)	CB4 (Traded)	CB4 (Non-Traded)	CB5 (Traded)	CB5 (Non-Traded)
CERO	0.07	0.72	0.07	0.72	0.07	0.72
AW	0.31	0.05	0.09	0.16	0.03	0.21
Total	**0.38**	**0.77**	**0.17**	**0.88**	**0.1**	**0.93**

9.9 Impact on Energy Bills

48. The costs incurred by energy suppliers in meeting their obligation are expected to be passed onto domestic customers through the variable element of their gas and electricity prices. This means that suppliers have an incentive to deliver their obligation as cost effectively as possible, and thus minimise the cost pass through.

49. While the scheme is in operation, the net impact of the policy on energy bills depends on whether a household has a measure installed under the scheme. The average cost of ECO on an annual household dual fuel bill is estimated to be the equivalent of around £27 per year during 2018[39]. However, for those households treated under ECO, the policy could deliver a net saving on their annual dual fuel bill of up to £300[40].

50. After the ECO exension ends (and assuming no continuation of the policy after that period), the bill savings for measures installed under the scheme continue to be realised, but the bill pass through falls to zero. This is because suppliers are no longer expected to incur costs from the scheme, while the bill savings from measures installed under the scheme will continue to be realised until the measures expire – often several decades after the scheme has ended.

10. Sensitivity analysis

51. A full list of sensitivities included in this impact assessment are shown in Table 13. Each assumption category is varied by the shown amount, holding all other assumptions constant, to determine the impact on the cost to suppliers of meeting their targets. Further details of the sensitivity assumptions can be found in Annex B, and Annex C the consultation stage IA[41].

Table 13: Sensitivity assumptions

Sensitivity category	Sensitivity detail	Low	Central	High
Identifiable technical potential (AW)[42]	Cavity Wall Insulation	6%	9%	12%
	Solid Wall Insulation	12%	SWI delivered to E, F or G rated social housing under CERO model	26%

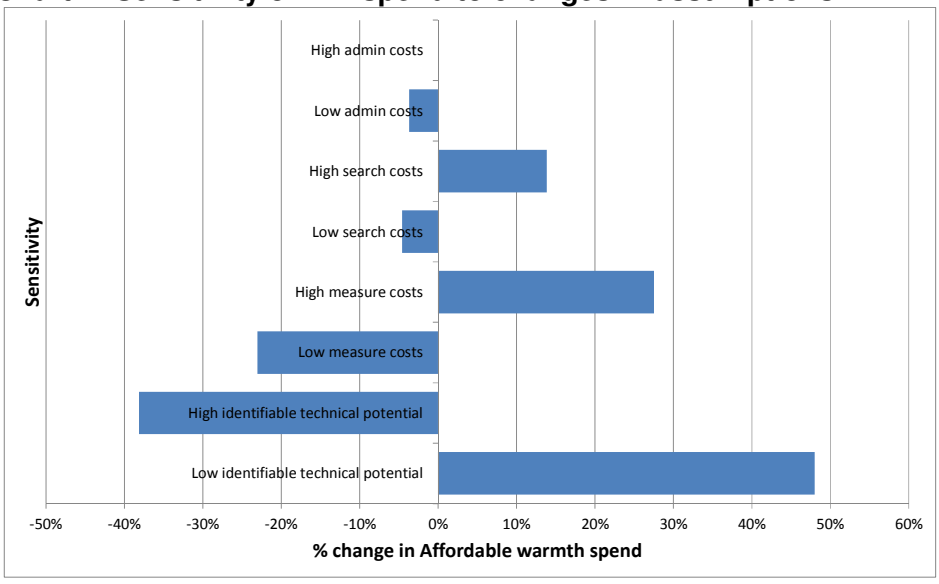
[38] Replacement boilers are estimated to bring forward up to 3 years' worth of savings relative to the counterfactual
[39] This would be the bill impact had ECO continued during the full year (the first quarter of 2017 would include supplier spend of £840m per year, so using would overstate the bill impacts of the ECO extension).
[40] Figure of up to £300 is based on installing solid wall insulation, estimated in the 2012 ECO Impact Assessment. Figure is adjusted for inflation.
[41] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/534669/ECO_Transition_Consultation_IA.PDF
[42] For the purposes of this IA, we assume that suppliers cannot identify all of the technical potential, so this sensitivity tests the impact of varying the 'findability' of eligible households.

Sensitivity category	Sensitivity detail	Low	Central	High
	Loft Insulation	4%	12%	19%
	First time central heating	20%	50%	80%
Measure costs	Insulation	20% Lower	-	20% Higher
	Replacement boilers	~25% Lower	-	~25% Higher
	First time central heating	32%-43% Lower	-	32%- 43% Higher
Search costs (AW only)[43]	Qualifying boiler replacements – on gas grid	£50	£50	£50
	Qualifying boiler replacements – off gas grid	£300	£300	£300
	Other measures – on gas grid	£50	£125	£200
	Other measures – off gas grid	£300	£400	£500
Third Party Contributions in CERO	Householders – SWI (% of capital cost)[44]	0%	25%	40%
	Householders – CWI and Loft	5%	10%	20%
	Other sources (£m per year)	33% lower	£75m	33% higher
Administration costs	-	29% Lower	£80m	N/A

10.1 Affordable Warmth Sensitivities

52. Chart 1 below shows the impact of varying each of the assumption categories above on the costs to suppliers of meeting their Affordable Warmth obligation. Each sensitivity is discussed in turn.

Chart 1: Sensitivity of AW spend to changes in assumptions



Measure costs

[43] The search costs are closely rated the identification of technical potential. However, the search costs that suppliers pay for each 'lead' depends, in part, on the level of competition within the market for lead generation.
[44] This also applies to Solid Wall Insulation under Affordable Warmth.

53. Chart 1 shows that increasing measure costs leads to a roughly 25% increase in supplier spend, while decreasing them reduces supplier spend by around the same amount. Most of the change reflects the assumed change in measure costs and slight change in the measure mix, with more heating measures installed under the low cost scenario than the central scenario due to changes in relative costs of the measures (and vice versa for the high cost scenario).

Identifiable Technical Potential

54. Varying the amount of 'identifiable' technical potential has a slightly asymmetric impact on suppliers' costs, with an increase in the identifiable technical potential decreasing supplier spend by slightly less than the increase (around 40% compared to nearly 50%) when the technical potential is smaller. This is because suppliers find it more difficult to find cheaper measures (such as loft insulation and low cost cavity wall insulation), and therefore have to install more expensive measures such as solid wall insulation and high cost cavity wall insulation in order to meet their targets.

Other sensitivities

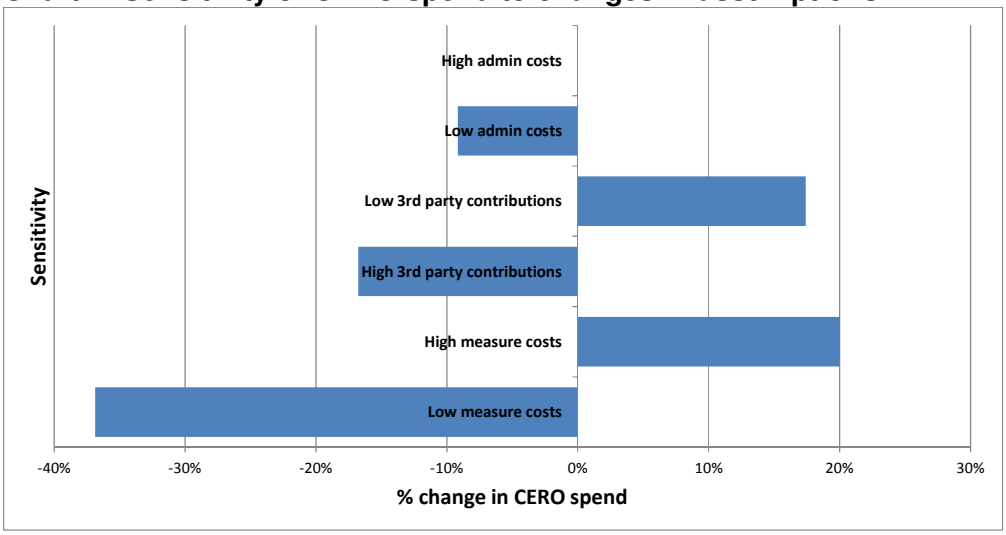
55. Chart 1 also shows the impact of varying the search costs suppliers incur in finding Affordable Warmth households, and supplier administration costs. These sensitivities show a lower variance (leading to variance in supplier costs of generally less than 10%).

56. While varying the search costs has broadly symmetric outcomes, supplier administration costs fall under the low administration costs scenario, but do not increase under the high scenario. These high and low administrative cost scenarios were based on the highest and lowest of the supplier estimates discussed in Section 9.7, and reflect that some suppliers expected admin costs to fall more substantially than we assumed in our central scenario, but no suppliers expected them to be much higher.

10.2 CERO Sensitivities

57. Chart 2 shows the impact of varying the CERO assumptions. Similar to the Affordable Warmth sensitivities, the largest variance occurs when varying the assumed measure costs. As before, the sensitivities are discussed, in turn, below.

Chart 2: Sensitivity of CERO spend to changes in assumptions



Measure Costs

58. Under CERO, increasing measure costs leads to a roughly 20% increase in CERO supplier spend, while decreasing the measure costs reduces spend by nearly 40%. As with Affordable Warmth, there is therefore a slightly asymmetry in the impact.

59. While the asymmetric outcome under Affordable Warmth (above) is driven by changes in the composition of measures, under CERO, more householder and third party funding is assumed, and this is the primary driver.

60. When measure costs are low, household and third party funding make up a larger proportion of the total measure costs, reducing the amount suppliers have to contribute to the measures, and thus reducing their required spend in order to meet their extension targets. In contrast, when measure costs are higher, suppliers pay a greater percentage of the measure costs, thus increasing their required spend in order to meet their CERO targets.

Third Party Contributions

61. In order to test the impacts of third party funding, we estimated the impact of both reducing and increasing assumed third party funding by a third. As shown above, this has a broadly symmetric impact across the high and low scenarios, as any reduction or increase in third party contributions must be met with higher levels of supplier spend.

Other Sensitivities

62. The other sensitivity involves varying the assumption around supplier administration costs. This leads to a reduction in supplier costs by nearly 10% under the low administration costs scenario. Administration costs do not increase under the high administration cost scenario for the same reason as outlined in the Affordable Warmth sensitivity section above.

11. Direct Impacts (including costs and benefits to business)

11.1 Businesses and range of impacts considered in the EANDCB

63. Businesses that face a direct regulatory impact as a result of the ECO extension are large domestic energy suppliers with more than 250,000 customer accounts and that supply more than 400GWh of electricity or 2,000GWh of gas to domestic customers a year. The share of the overall obligation increases with the size of the supplier.

64. The supply chain will also be affected by the obligation, as demand from energy suppliers for installation and heating measures in order to meet their ECO targets benefits them. However, in line with BRE guidance, these changes are indirect and so its impacts are not captured in the EANDCB.

Direct Costs and Benefits

Direct Costs

65. While the costs suppliers incur are expected to be passed on from suppliers to customers through energy bills, we treat these costs as direct for EANDCB purposes, consistent with their treatment in past ECO IAs[45].

66. All key direct costs for the purposes of calculating the EANDCB have been monetised. These broadly fall into two categories – supplier delivery costs and supplier administration costs; both of these cost components are outlined in more detail in Section 8 above.

67. Section 7 also outlines that the level of the market clearing subsidy is assumed to be the last (or marginal) measure installed for suppliers to meet their obligation – a subsidy level which is then

[45] The 2012 ECO IA can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42984/5533-final-stage-impact-assessment-for-the-green-deal-a.pdf , while the 2014 ECO IA can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373650/ECO_IA_with_SoS_e-sigf_v2.pdf

assumed to be paid to households. As some households would be willing to install measures for a lower level of subsidy than the one they receive, these households are assumed to receive economic rents. This increases the cost to suppliers of meeting their obligation.

68. Consistent with the 2012 and 2014 ECO IAs, we have assumed (in the absence of evidence to the contrary) that households capture all of the economic rents. In practice it is possible that suppliers (and installers) may also capture some of the economic rents. This means our approach represents the most conservative projection of direct costs to suppliers.

Direct benefits

69. No direct benefits to obligated parties in complying with the regulations have been identified, meaning there would be no direct benefits to businesses contained within the EANDCB.

EANDCB position and Business Impact Target scoring

70. For the purposes of this IA, we focus on the EANDCB over the extension period. The EANDCB of the 18 month ECO extension (supplier spend of £620m) is £576m; conversely, the end of the existing regulation generates an OUT of £781m; netting the IN and OUT off against each other generates a net OUT of -£205m[46]. These impacts are shown in the Table 14 below.

Table 14: Equivalent Annualised Net Direct Cost to Business (2014 prices)

EANDCB ECO Extension (£620m supplier spend for 18 months)	EANDCB Current ECO (£840m supplier spend for 18 months)	Net EANDCB position – ECO Extension less continuation of existing ECO (Overall OI3O)	Business Impact Target
£576m	£781m	-£205m	-£3,041m

Business Impact Target scoring

71. The end of the current ECO scheme will provide a saving of £3,905m (5 years at £781m EANDCB). Conversely the new scheme will produce a BIT of £864m (1.5 years at an EANDCB of £576m). The net BIT score is therefore a saving of -£3,041m.

11.2 Small and Micro Business Assessment

72. Businesses that are directly affected by the extension to ECO are large energy suppliers – those with over 250,000 customer accounts and supplying over 400GWh of electricity or 2,000GWh of gas per year. Some small and micro businesses in the supply chain may also be indirectly affected by the increased level of supplier demand for their services as a result of the extension to ECO. This is expected to have a positive impact on these companies' gross profits compared to a counterfactual of no ECO[47]. On the grounds of proportionality, however, we have not attempted to calculate these gross or net profits resulting from this 18 month extension.

73. Given the growth of independent suppliers since the inception of ECO, this IA includes an independent supplier assessment, which is set out in Annex G.

[46] As the extension measure effectively extends the current ECO scheme, the EANDCB is calculated assuming that the ECO continues (at current supplier spend and less focus on fuel poverty) until September 2018. This is consistent with the current Better Regulation Framework method to uniformly calculate the EANDCB.
[47] However, at an estimated supplier spend of around £620m per year during the extension, demand is expected to be lower than under the previous phase of the obligation (which was estimated to be around £820m per annum).

Annexes

Annex A – Further Policy Details

Changes to the policy design since the consultation

Length of the extension period

74. Respondees to the consultation generally supported the proposal of an extension but some, particularly suppliers, raised deliverability concerns given the relatively short amount of time to achieve the new requirements. Suppliers and installers need time to adjust, in particular against the new requirements and the cap on gas qualifying boilers, and there could be a risk of price spikes near the end of a single year extension as suppliers play 'catch up' – with these costs passed back to bill payers. The Government has therefore decided to extend the extension period from 12 months to 18 in recognition of the scale of change required, and to avoid any spikes in market prices. This will also enable time to learn from the extension scheme in considering the design of the future obligation from 2018 – 2022.

Volume of solid walls to be delivered under the solid wall minimum

75. The consultation showed that there was generally very strong support for retaining a solid wall insulation (SWI) minimum within the extension, with a significant number indicating that it should be higher than the 17,000 proposed. Respondees also indicated that the estimated cost of solid wall insulation was lower than assumed in the consultation stage IA, due to it over estimating the capital costs of solid wall insulation, and its exclusion of third party funding.

76. Following this feedback, and additional evidence gathered since the consultation stage IA, the costs to suppliers of delivering solid wall insulation has been revised down (see Annex B for more information).

77. Given the strategic importance of solid wall insulation in delivering Government objectives (discussed below), and the downward revision to its estimated cost, Government will set a slightly higher minimum of around 21,000 solid walls per year (or around 32,000 over 18 months). This also represents the midpoint between the annual solid wall delivery required during ECO to March 2017 (25,000 per year) and the 17,000 proposed in the consultation[48].

Eligibility

78. The Government has decided to adopt amended income thresholds for Tax Credit and Universal Credit. The income thresholds will improve the fuel poverty targeting of the scheme, while increases in the thresholds will expand the number of eligible households in private housing tenure to approximately 4.2m (and 4.7m households overall). This is approximately 0.7m more eligible households than in the consultation proposal, with most of them being on lower incomes and will include over 100,000 extra living in fuel poverty , keeping the proportion of fuel poor homes as a proportion of the total of eligible households higher than under the previous scheme (and is only fractionally lower than the consultation proposals).

Introducing a rural safeguard into the Carbon Emission Reduction Obligation (CERO)

79. The Government has decided to remove the CSCO rural sub-obligation from April 2017 but introduce a new rural sub-obligation of 15% under CERO to safeguard rural delivery. This will be a simpler obligation than the CSCO sub-obligation as homes in all areas defined as rural will be

[48] Note that this still represents a significant reduction on current delivery rates (of around 34,000 per year seen since April 2014), with some suppliers on course to vastly exceed their share of the current solid wall minimum requirement (to be met by March 2017).

eligible. Delivery to a range of rural property types and locations, including 'deep rural' areas (villages, hamlets and isolated dwellings), has been taking place in CERO at a similar level as within CSCO, despite only the latter having a rural delivery requirement. Therefore, the Government believes that introducing a sub-obligation under CERO will ensure delivery in rural communities without adding undue burden on energy suppliers.

80. There will continue to be incentives for rural delivery, including under Affordable Warmth. For example, the decision to significantly reduce the number of qualifying mains-gas boiler replacements, a measure more prevalent in urban areas, is expected to incentivise the delivery of various measures in rural areas. The current uplifts for non-gas fuelled homes will be retained and will continue to act as an incentive for delivery in rural properties. The Government will also continue to gather address-level data in rural areas in order to monitor rural delivery.

Rationale for the final policy position

81. **Size of the overall obligation** – the targets for the extension equate to an estimated level of supplier expenditure of £640m per year in 2017 prices (£600m in 2013 prices), a reduction of over £200m compared to estimated level of the current scheme at around £860m per year. This reduction in supplier spend reflects Government desire to minimise the costs of policies on consumers' energy bills and the regulatory burden on business.

82. **Increasing the focus on fuel poverty** - the Government is clear that it is unacceptable that some households living on a low income should have to do so in properties that cannot be kept warm at reasonable cost. Founded in the equity considerations outlined above, Government proposes to focus more subsidy on those who are most in need by focusing around 70% of supplier effort on Affordable Warmth compared to 30% on CERO during the extension, and also better focussing the eligibility criteria of the Affordable Warmth group. The impact of this is examined in Section 9.

83. Alongside increasing the share of the overall ECO comprised of Affordable Warmth, the Government proposes to amend the AW eligibility criteria in order to better target the fuel poor. The current AW eligibility criteria – based on private tenure households in receipt of a subset of means-tested benefits and tax credits – were set in 2012, before the conclusions of the Hills Fuel Poverty Review were enacted.[49] This review led to a new indicator for fuel poverty in England in 2013. Based on analysis of the English Housing Survey we estimate that currently around 29% of AW eligible households are fuel poor, and these households represent around 30% of all fuel poor households in England.

84. The income thresholds have been increased slightly from those set out in the consultation stage IA. This acts to increase the size of the eligible pool from 4m to 4.7m, and will increase the cost effectiveness of the Affordable Warmth obligation, allowing more homes to be treated (and more carbon to be saved) for the same amount of supplier spend.

85. The changes to eligibility would in combination improve the estimated percentage of AW eligible households in England that are fuel poor from 29% to up to around 35% (increasing accuracy by a fifth). Further, the fuel poor homes eligible for AW would account for up to 52% of all fuel poor households in England.[50]

86. **Not extending the Carbon Saving Communities Obligation (CSCO) targets and moving the rural safeguard from CSCO to CERO** – BEIS analysis shows that the prevalence of fuel poverty in CSCO areas in England differs little from the national average (around 12% compared to 10% nationally).[51] By constraining the eligible areas, the availability of the most

[49] Hills (2012). Getting the measure of fuel poverty – final report of the fuel poverty review. Available at: https://www.gov.uk/government/publications/final-report-of-the-fuel-poverty-review

[50] Equivalent estimates are not available for Scotland and Wales, although we would expect the improvements in measuring household income and the inclusion of inefficient social housing to boost accuracy rates across GB.

[51] Derived from the fuel poverty data set and cross-checked by matching with the sub-regional fuel poverty statistics.

cost-effective measures is restricted with little targeting benefit, and as a result on a like-for-like basis CSCO is on average more expensive in terms of carbon abatement than the unconstrained CERO. For example, from July 2014 – December 2015, CSCO cost suppliers £48/tonne compared to £39/tonne under CERO.[52]

87. The legislation also currently requires suppliers to deliver 15% of their CSCO obligation in rural areas. ECO delivery statistics show that approximately 15% of delivery under both CSCO and CERO occurs in rural areas – suggesting that there are sufficient incentives under CERO to encourage cost-effective rural delivery.

88. It is important to ensure that rural locations are not disadvantaged under the CERO scheme, however. Therefore a rural safeguard has been introduced to safeguard delivery to rural locations. Implementing the rural safeguard within CERO rather than CSCO will be a simpler mechanism than the current CSCO (due to the additional requirements – alongisde the rural safeguard – within CSCO).

89. Given that 15% of delivery under CERO is currently going to rural locations, the safeguard is not expected to be binding, and therefore should not increase the costs of the scheme compared to the policy proposed in the consultation.

90. **Solid Wall Insulation (SWI) Minimum** – SWI can for many properties generate substantial energy savings and wider societal benefits (such as improved comfort), but it typically has higher upfront costs than other energy efficiency measures. As a result, suppliers tend to need to offer higher subsidy rates (or involve match funding from third parties) than for other measures, and therefore face little incentive to deliver SWI in the absence of a minimum. SWI is an important measure for saving carbon, and alleviating fuel poverty. For example, in England, almost half of fuel poor households live in solid walled homes, a figure that rises to more than 70% in F and G-rated properties which are the focus for the Government's 2020 fuel poverty target milestone.[53]

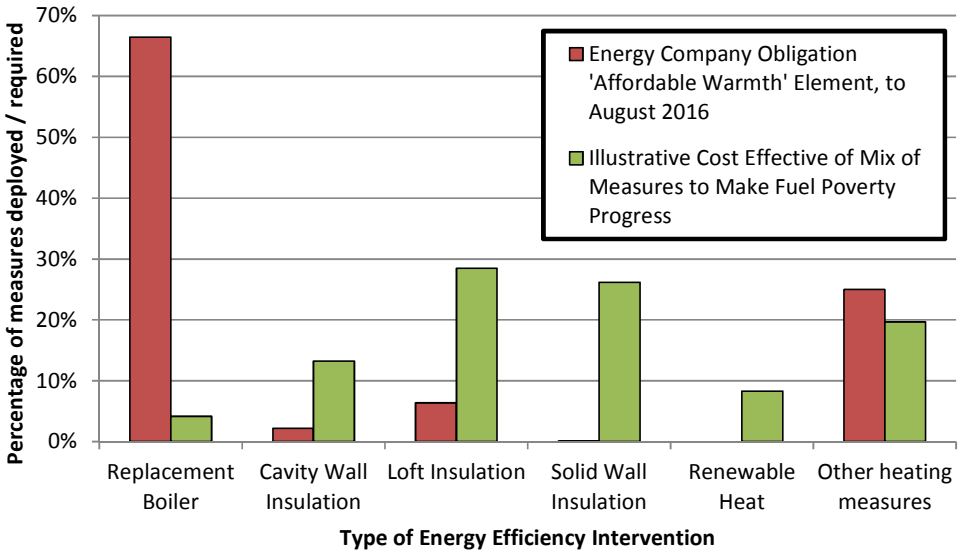
91. Solid wall insulation measures are more expensive than other types of insulation, and as such retaining a solid wall insulation minimum threshold for the extension would increase the cost of the scheme relative to the number of measures installed. However, many fuel poor households live in solid walled properties and there are potentially benefits in ensuring a minimal level of support for this measure, in order to make progress towards our long-term fuel poverty targets and to maintain the supply chain.

92. As such, it is proposed to maintain an SWI minimum from the current scheme into the extension scheme. Given the reduction to the overall size of the scheme, it is proposed to reduce the minimum from the equivalent of around 25,000 SWI installations per year under the current scheme[54] to around 21,000 installations per year during in the extension (around 32,000 over the 18 months of the extension). This is the midpoint between current levels and the pro-rated reduction set out in the consultation stage IA, reflecting evidence that solid wall insulation is currently being delivered (and is likely to continue to be delivered during the extension) at a lower cost than set out in the consultation stage IA .

93. **Limiting qualifying mains-gas boiler replacements** – Chart A1 compares the mix of measures delivered under Affordable Warmth to date, to the mix of measures our analysis suggests would be cost effective for making progress in tackling fuel poverty. This shows how historical deployment under Affordable Warmth has been predominantly replacement boilers, whereas our analysis would point to a much more diverse mix of measures in order to make progress towards fuel poverty objectives in the most cost-effective way.

Chart A1: Comparison of historical AW delivery and illustrative mix of measures for making cost-effective progress on fuel poverty

[52] Based on data underlying BEIS Household Energy Efficiency Statistics, available at: https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics
[53] Fuel Poverty Statistics (2016), available at: https://www.gov.uk/government/collections/fuel-poverty-statistics
[54] The current scheme's minimum was estimated to be the equivalent of 100,000 solid walled homes over approximately 4 years, implying around 25,000 homes per year.



94. Around 90% of Affordable Warmth delivery to date has been replacement boilers and accompanying heating controls; since April 2014 this has equated to the delivery of around 100,000 boilers per year.

95. BEIS analysis of the English Housing Survey suggests that deploying boilers does not ensure substantial and lasting progress towards Government's fuel poverty commitments. In fact, the improvement in energy efficiency from installing a more efficient boiler is only slight when compared to other measures such as insulation or first time central heating. They do help ensure that low income households have a functioning heating system, but are unlikely to improve the energy efficiency rating of the property and therefore have a limited impact on key fuel poverty objectives, such as the statutory target for England and its interim milestones. There is therefore a strong case for rebalancing Affordable Warmth in order to deploy a more varied mix of measures, particularly insulation.

96. There is clear evidence, however, that there is additionality from installing boilers under AW, and that this has helped people who are often unable to replace their broken boilers for some considerable period of time. Annex C outlines the analysis of when particular groups of fuel poor households are able to replace their boilers without Government support. It shows that typically these homes replace their boilers after around 15 years, which is 3 years beyond the typical lifetime of a boiler, and 5 years later than non-fuel poor households.[55] Intervening at the point of the boiler breaking can mean avoiding resorting to coping mechanisms in the absence of a working heating system, while the householder gathers the means to replace the boiler themselves. The recent evaluation of the Warm Front scheme provides examples of the types of coping mechanisms low income households can resort to when their boiler breaks and they do not have the means to replace it – such as using expensive plug-in heaters for warmth and a kettle for hot water.[56]

97. Further, the scale of boiler replacements under the scheme at present also means that significantly restricting volumes and altering the rules at the same time would risk making the scheme undeliverable. For these reasons, the extension will allow suppliers to continue to deliver boilers towards their AW targets, up to a limit.

98. The extension stipulates that no more than the equivalent of around 25,000 qualifying gas boiler replacements can be installed per year under the extension – around a third of the current delivery rate. This level has been chosen to strike a balance between ensuring progress against

[55] Social housing tenants typically see their boilers replaced every 12 years, the average estimated lifetime of a typical boiler.
[56] Warm Front Process Evaluation, available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322901/Warm_Front_Evaluation_Report.pdf

our fuel poverty objectives, continuing to support low income households with broken boilers, and avoiding large step changes in the ECO scheme during the extension.

99. Finally, the Government has decided to continue to restrict boiler replacements to private tenure only. The evidence on boiler lifecycles suggests that in the absence of subsidy support, boilers in social housing are replaced in line with the average boiler lifetime. This would imply limited or zero additionality from supporting replacement boilers in social housing.

100. **Delivery and administration** – the proposals to remove the requirement to calculate carbon scores based on a full house survey, produce Green Deal Advice Reports (GDARs) or a Chartered Surveyor's Report (CSR) could lead to savings of in the region of several hundred pounds per installation. We have gathered evidence from suppliers on the extent to which these proposals will result in reductions in admin burden, freeing up greater resources for installing measures (see Section 9).

Deemed scores

101. In order for suppliers to meet their obligations, they must deliver measures to eligible homes. Each measure is awarded a 'score' based on the anticipated carbon or notional bill saving that will be achieved over the measure's lifetime. The current ECO scoring system requires a unique score to be calculated for each measure in every property treated under the scheme, using the Standard Assessment Procedure (SAP) or reduced data Standard Assessment Procedure (RdSAP).[57] Under this system, certified domestic energy assessors are required to carry out a full house assessment of each property in order to determine a savings score for a measure. The use of SAP and RdSAP under ECO is consistent with the methodology used under the Green Deal, where a bespoke estimate of savings was required to ensure that the golden rule was met.

102. The requirement to use individual household SAP and RdSAP assessments has been cited as a particular cause of complexity within the scheme, due to the need to collect and evidence a large quantity of data for every measure installed. Stakeholders have reported that installers would typically be uncertain of the commercial value of a measure until the assessment had been completed – making it difficult to make a standard offer to all households in a particular area, and meaning that sometimes an installer would decide not to proceed with a measure once the assessment had been carried out. This reduces the cost effectiveness of the scheme and could be potentially frustrating for householders.

103. In addition, there have been some concerns regarding the accuracy of the information collected during property assessment, which has undermined confidence in the savings being awarded in some instances. In order to gain assurance in the scores, a number of compliance checks have been introduced by the scheme administrator (Ofgem). Under the first phase of ECO, these checks resulted in over 840,000 tCO_2 savings and over £6m cost savings being removed from the scheme. The checks themselves have increased administrative complexity.

104. In order to simplify the scheme and improve value for money, the extension will require measures installed from 1 April 2017 to be scored using 'deemed scores'. These scores are based on a limited number of predictable and checkable inputs, such as property type, number of bedrooms and heating system, which will simplify scheme delivery and administration, and reduce costs. The scores that suppliers will use during the extension have been published by Ofgem.[58]

105. To calculate a final score for notification, deemed scores will be subject to the same multiplication factors currently applied in ECO, which are accounted for in the lifetime scores published by Ofgem:

[57] More detail can be found on these approaches here: http://www.bre.co.uk/sap2012/page.jsp?id=2759

[58] The deemed scores consultation and final scores can be found at: https://www.ofgem.gov.uk/publications-and-updates/response-eco-deemed-scores-consultation

- **Lifetime** – the number of years that a measure is expected to continue delivering savings at the calculated level. Current ECO lifetimes range from one to 42 years
- **In-use factors** (for CERO measures only) – reduces the savings calculated using SAP to take account of likely measure performance in use. Affordable Warmth does not require these corrections as the unadjusted savings calculated in SAP are consistent with the way that fuel poverty is measured under Government targets
- **Non-gas uplifts** (for Affordable Warmth insulation and qualifying boiler measures) – these are an incentive mechanism which increases the savings for measures delivered to homes not heated using gas. This is currently in place under ECO and will remain appropriate under the extension to help incentivise delivery to those homes which are most expensive to heat
- **Qualifying gas deflator** (for Affordable Warmth gas boiler replacement measures) – reduces the savings for qualifying boiler measures which replace one mains gas-fuelled boiler with another. As above, this is currently in place under ECO and will remain appropriate under the extension to help encourage delivery to those homes which are most expensive to heat

106. Deemed scores have been calculated for all measure types currently carried out under ECO, with the exception of district heating system (DHS) measures, for which a bespoke SAP assessment would be more appropriate. This is judged to be a suitable exception for two key reasons; (i) the particular configuration of DHS measures varies considerably from scheme to scheme, suggesting that a set of deemed scores would not be widely applicable; and (ii) the higher costs, detailed planning requirements and larger scale of these schemes is better suited to the production of bespoke SAP assessments than for other ECO measures, as such assessments are much less likely to be prohibitively burdensome for industry.

Deemed score uplift

107. The deemed scores published by Ofgem lead to lower savings, on average, for each measure installed than under the current bespoke ECO scoring regime, which is based on SAP. For example, under deemed scores all 3 bedroom semi-detached properties with a gas boiler would achieve the same score for cavity wall insulation (assuming the same insulation material was used) – the deemed score is based on insulating the 'average' property of this type. However, under SAP it is possible to achieve a higher score for the same property archetype, for instance by targeting a larger than average 3 bed semi-detached property. There are over 100 inputs to a typical SAP score and therefore many ways that the score can be 'optimised' as such.

108. Given that the obligation targets are set based on modelling using deemed scores, this means that any measures delivered towards the extension targets before April 2017 (when the scoring methodology changes from SAP to deemed scores) would generally achieve higher scores than have been modelled. As a result, the targets set under the extension could be achieved by delivering fewer measures than anticipated if suppliers deliver against their extension obligation prior to April 2017. This would reduce the overall benefits of the scheme.

109. To address this an uplift is being applied to the deemed scores of 1.3 for measures delivered against CERO and Affordable Warmth, i.e. all deemed scores will be increased by 30%. This brings deemed scores broadly in line with scores achieved to date under the current ECO. The obligation targets have also been increased accordingly.

110. The value of the uplift has been determined through analysis of three data sources:

- **Deemed scores published by Ofgem:** These are matched to households in both the CERO and AW models for each measure.
- **SAP scores modelled using the National Household Model (NHM):** the NHM has been used to generate energy savings per household from installing different measures under SAP assumptions. These energy savings were converted to SAP-based ECO scores by applying emissions factors, SAP fuel prices, measure lifetimes, in-use factors, and the

Affordable Warmth multipliers as appropriate, and matched to households in the CERO and AW models for each measure.

- **Scores achieved to date under the current ECO, based on delivery data:** estimates are made of the relationship between floor area and ECO scores for different measures, property types (house, bungalow, flat, and maisonette) and fuel types using regression analysis. These showed broadly linear relationships, which were used to estimate current SAP-based ECO scores for each household in the CERO and AW models.

111. The analysis was undertaken according to the following steps:

- For the extension scheme period, use the CERO and AW models to estimate delivery of measures, deemed lifetime bill and carbon savings per measure, and overall targets based on the current (non-adjusted) deemed scores
- Calculate lifetime bill and carbon savings per measure and the overall targets based on this delivery mix, using the matched NHM scores and current SAP-based ECO scores
- Compare these against deemed savings and targets, to inform the uplift value.

112. This analysis showed that NHM and current SAP-based ECO scores were between 90% and 205% of the value of deemed scores across measures under Affordable Warmth, and between 95% and 160% across measures in CERO.

113. The most appropriate overall uplift to apply will depend on the mix of measures that suppliers deliver against their extension targets – which is uncertain. To inform the choice of uplift, the AW and CERO models were used to simulate the mix of measures under the extension, and the overall targets using SAP were between 34% and 37% higher than targets calculated using deemed scores for Affordable Warmth. For CERO the difference was between 20% and 50%.

114. Given that there is scope in practice to achieve higher deemed scores than the models account for (for example, by insulating solid walls to achieve a lower u-value than the assumed value of 0.3), the Department has taken a conservative decision on the choice of uplift by setting it towards the lower end of ranges generated as part of the analysis – a value of a 30% uplift (i.e. all deemed scores will be multiplied by 1.3 for the purposes of setting the target and scoring measures against that target).

Annex B – Improvements to the Evidence Base

115. The evidence base underpinning this IA is as outlined in the consultation stage IA. The exceptions (the improvements to the evidence base) are outlined in this annex.

Insulation potential

116. Since the publication of the consultation stage IA, BEIS has published updated National Statistics on the estimated remaining potential to install loft, cavity and solid wall insulation.

117. The National Household Model and Affordable Warmth Model have been updated with these remaining technical potential figures, and the remaining technical potential adjusted for insulation expected to be delivered between 2016 and the start of April 2017 (the start of the ECO extension). The assumed remaining technical pontential at the end of each financial year is outlined below.

Table B1: Estimated remaining technical potential for insulation measures across the GB stock

Date	Cavity wall insulation	Solid wall insulation	Loft insulation
03/2013	6.2m	7.9m	6.2m
03/2014	5.9m	7.9m	6.1m

Date	Cavity wall insulation	Solid wall insulation	Loft insulation
03/2015	5.6m	7.9m	5.9m
03/2016	5.5m	7.8m	5.8m
03/2017	5.4m	7.8m	5.8m

118. Loft insulation remaining potential figures exclude lofts defined in BEIS statistics as being hard to treat (these includes lofts which are unfillable, this can occur in properties with a flat roof or in properties where the roof has a very shallow pitch which makes the loft space inaccessible).

119. Cavity wall insulation remaining potential figures exclude cavities defined in BEIS statistics as having limited potential.

120. Given the restrictions on eligibility, technical potential in the Affordable Warmth group is lower than across the GB housing stock. Table B2 shows the estimated remaining technical potential after applying the Affordable Warmth eligibility criteria.

Table B2: Estimated remaining technical potential for measures in the AW eligible group across the GB stock

Millions of measures	Technical Potential in AW eligible group
Low cost Cavity Wall Insulation	0.8
High cost Cavity Wall Insulation	0.09
Loft Insulation	1.1
Solid Wall Insulation	1.6
Boiler Upgrades - gas	0.9
Boiler Upgrades - non-gas	0.06
Qualifying boiler replacements - gas	0.5
Qualifying boiler replacements - non-gas	0.02
First time central heating - gas	0.06
First time central heating - non-gas	0.03
Heating controls	0.4
Ground Source Heat Pump	1.0
Air Source Heat Pump	1.5

121. The updated estimates and a detailed methodology note on how they have been derived can be found in the September 2016 Household Energy Efficiency Statistics Publication.[59]

Proportion of technical potential that is identifiable under AW

122. In the Affordable Warmth modelling, restrictions are placed on how much of the technical potential the supply chain can identify and install in any single year, i.e. they don't have perfect sight of the market. To account for this we assume that each year suppliers can only target a random proportion of available potential, with this proportion varying by measure. The assumed proportion of technical potential that is identifiable is shown in Table 13, under central, low and high scenarios

123. The Low, Central and High values have been derived as follows:

[59] The updated statistics can be found here: https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-september-2016, while the methodology note can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/554446/Methodology_Note_September_2016_Final.pdf

- **Low** values are based on calibrating the AW model such that it mirrors historical delivery (after setting model parameters to mimic the current AW obligation design). Given that the delivery under Affordable Warmth to date has been dominated by boiler replacements with less incentives to deliver (and identify) other types of measure, we have assumed that this reflects a scenario where the ability to identify potential for others measures is towards the low end of the scale.

- **High** values are largely based on the proportion of technical potential that was observed under the CERT Super Priority Group. This is assumed to be a reasonable proxy for the maximum level of potential that can be identified in a comparable group to the Affordable Warmth eligible pool, given the high levels of deployment at that time.

- **Central** values are taken as the mid-point between low and high values.

- It was not possible to apply the above approach to first time central heating as delivery under AW has been so limited. Instead, we have set the low value based on the maximum proportion that achieves zero central heating delivery when calibrating to historical delivery, given that we believe negligible levels have been delivered to date. We have assumed 80% of first time central heating potential will be identifiable under the high scenario, and the central estimate of 50% is again the mid-point between low and high values. While this is an assumption, it is anticipated that the lack of a central heating system is relatively straight forward to identify, particularly compared to alternative measures.

- We also have not applied constraints to replacement boiler potential, as previous delivery under Affordable Warmth indicates that suppliers can identify this potential easily and deploy at scale – i.e. 75,000 – 100,000 boilers per year, relative to a proposed qualifying gas boiler replacement limit of 25,000 in the ECO transition.

- For Solid Wall Insulation, under the central scenario, the CERO model is used to estimate the likely uptake in E, F and G-rated social tenure properties. It is assumed that suppliers would deliver these measures as part of wider social housing projects, and then choose to notify the E, F and G-rated properties under Affordable Warmth. This would be a result of it being more cost-effective to deliver further measures under CERO to 'replace' these installations, compared to delivering more measures under Affordable Warmth. The E, F and G-rated social tenure SWI installations delivered in the CERO model are therefore matched to households within the AW model such that they form part of the cost-effective supply curve for delivery under the AW obligation, and removed from delivery under the CERO obligation.

Proportion of technical potential that is targeted under CERO

124. Modelled delivery under CERO is targeted to properties that have technical potential for insulation. The National Household Model (NHM) used to model CERO uses a propensity score to derive levels of uptake across the available technical potential within the GB housing stock. The propensity scores are derived from historical uptake under ECO 2 based on the size of the available technical potential during this period. The different propensity scores across segments of the housing stock are listed in Tables B3 to B5 below.

Table B3: Cavity Wall Insulation propensity scores

Dwelling type	Social Housing	Owner Occupied	Private Rented
Bungalow	1.8%	2.4%	1.2%
Flat	1.3%	1.5%	0.6%
House	1.2%	2.1%	0.5%

Table B4: Solid Wall Insulation propensity scores

Dwelling type	Social Housing	Owner Occupied	Private Rented
Bungalow	1.3%	0.4%	0.1%
Flat	0.5%	0.3%	0.0%
House	1.3%	0.2%	0.0%

Table B5: Loft Insulation propensity scores

Dwelling type	Social Housing	Owner Occupied	Private Rented
Bungalow	0.4%	2.3%	1.1%
Flat	0.0%	0.0%	0.0%
House	0.2%	0.9%	0.3%

Deemed scores

125. As outlined in Annex A, above, since the publication of the consultation stage IA, Ofgem has published the final set of deemed scores for the ECO extension. These deemed scores (and the uplift – also discussed in Annex A) have been incorporated into the Affordable Warmth and National Household Models.

Classification of cavity wall insulation

126. Consultees also felt that the costs of installing 'hard to treat' cavity wall insulation was broadly equivalent to the costs of 'easy to treat' cavity wall insulation.[60] This view has been supported by a forthcoming publication by the Energy Saving Trust on non-standard cavity and loft insulation[61], which showed that the majority of unconventional cavity walls (which are technically classed as 'hard to treat') are similarly costly to insulate as standard cavity walls ('easy to treat').

127. As a result, we are no longer classifying cavity walls on whether they are 'hard to treat' or 'easy to treat', and instead draw a distinction between 'low cost' cavity wall insulation (which incorporates most hard and easy to treat cavity wall types) and 'high cost' cavity wall insulation (which incorporates particularly expensive cavity wall types – for example, cavity walls with structural faults[62]).

Insulation costs

128. Some consultees felt that the solid and cavity wall insulation capital costs presented in the consultation stage IA were too high, suggesting that solid walls were currently being insulated for around £8,000, while hard to treat cavities were being insulated for around £600 (compared to consultation stage IA estimates of around £10,000 and £1,000 for solid and cavity wall insulation respectively). These same consultees felt that the costs recently observed would continue during the ECO extension.

129. BEIS separately commissioned Cambridge Architectural Research Ltd (CAR) to survey installers on the costs they charge for insulating loft, cavity and solid walls in a range of different property types and sizes. CAR's report[63] supported consultees' views that the consultation stage IA was overstating the costs of installing solid wall insulation, and their estimates were in line with the evidence on costs presented to us by consultees. BEIS subsequently tested the estimates derived by CAR with stakeholders and found strong support for the updated assumptions.

[60] For definitions of hard and easy to treat cavity wall insulation, please the methodology note accompanying September 2016's Household Energy Efficiency Statistics: https://www.gov.uk/government/publications/household-energy-efficiency-statistics-methodology-note
[61] Forthcoming
[62] Forthcoming
[63] Forthcoming

130. In addition, we have removed the 33% discount to solid wall insulation in social housing (which was previously applied to account for economies of scale). This is because the updated cost estimates produced by CAR are likely to implicitly include a discount for social housing, and therefore could lead to double counting of the economies of scale from doing large social housing projects.

131. Table B6 shows the new capex assumptions for insulation measures, covering both the materials and labour, by dwelling type. The table also shows the new estimated costs for 'low cost' and 'high cost' cavity wall insulation (CWI) – replacing the previous classifications of 'easy to treat' and 'hard to treat' CWI.

132. The cost estimates in Table B6 are predominantly based on a report produced by Cambridge Architectural Research (CAR) for BEIS. The exception is loft insulation, where the Department's existing cost assumptions were already in line with the evidence provided by stakeholders, and CAR's estimates were based on rafter and joist insulation (which is slightly more expensive to insulate than standard loft top up).[64] The underlying cost data are the same as those used in the 2014 ECO Impact Assessment, with adjustments made by house type. These insulation assumptions are used across both the National Household Model and Affordable Warmth Models.

133. For the purposes of this IA, we do not assume any reductions in the real costs of installations over time. In practice, technological improvements and increased competition may lower the costs of installing energy efficiency measures and therefore lower the costs of the Regulations. We also do not expect the costs to rise over time, either, as it is assumed that the supply chain can meet the additional demand for energy efficiency measures without hitting capacity constraints.

Table B6: Capex Assumptions – Insulation measures (£, 2015 prices) (the percentage change from the consultation stage IA assumptions are shown in parenthesis)

Dwelling Type	Cavity Wall Insulation (Low Cost)	Cavity Wall Insulation (High Cost)	Loft Insulation	Solid Wall Insulation - External	Floor area (m^2)
Detached - Large	950	3,700	640 (-)	11,500 (-17%)	>117.03
Detached - Small	680	2,300	310 (-)	10,200 (-1%)	<117.03
Bungalow - Large	760	3,700	640 (-)	10,400 (-25%)	>117.03
Bungalow - Small	540	2,300	310 (-)	9,200 (-11%)	<117.03
Semi-detached/End of Terrace - Large	660	4,300	370 (-)	8,400 (-21%)	>80.45
Semi-detached/End of Terrace - Small	529	2700	230 (-)	7,800 (-14%)	<80.45
Mid Terrace - Large	505	4,300	340 (-)	7,500 (-20%)	>75.5
Mid Terrace - Small	460	2,700	220 (-)	6,800 (-14%)	<75.5
Flat - Large	430	2,500	430 (-12%)	6,700 (-32%)	>54.29
Flat - Small	380	1,600	180 (-38%)	5,300 (-35%)	<54.29

Third Party Funding

134. In the consultation stage IA, the conservative assumption was made not to include third party funding (funding from other regional or national government energy efficiency schemes, local

[64] The exception was for flats, where BEIS judged that its previous cost estimates were too high. The Department deflated our previous cost assumptions for flats to bring the difference between the CAR estimates and our current loft top up assumptions into line with other house types.

authorities or housing associations) into its supplier delivery cost estimates. This decision was due to a lack of firm funding commitments, meaning there could be no guarantee that third party funding would continue to be available in the market from April 2017.

135. A number of consultees felt, however, that the exclusion of all third party funding was too conservative and could lead to a significant overstatement of the costs to suppliers of meeting the extension targets. They argued, for example, that third party funding had driven down the costs of solid wall insulation as low as £25 per tonne of carbon during 2015, compared to over £100 per tonne estimated in the consultation stage IA.

136. BEIS has since analysed the measures delivered by suppliers since April 2014, and the associated costs they incurred over that period. The Department has also separately requested further evidence from obligated suppliers and insulation industry on the costs they are paying for solid and non-solid wall measures. This analysis suggested that third party contributions have had a significant bearing on the costs of delivering the CERO obligation, and particularly the costs of delivering solid wall insulation. For this measure, BEIS estimates that up to three quarters (£140m - £150m) of the total measure costs over 2015 has come from either the household or third party sources.

137. For the purposes of this IA, BEIS acknowledges that excluding third party funding is likely to significantly overstate the costs to suppliers of delivering CERO, and therefore some third party funding has been assumed in this IA. Funding sources that were in place under the current ECO but are either due to end before April 2017, or it is uncertain that they will continue beyond April 2017, have been excluded. This includes funding provided by the Welsh Assembly Government, and from UK Government policies - Green Deal Communities[65] - which have now come to an end.

138. Of this remaining funding that has been in place under the current scheme – around £100m per year:

    a. around a quarter is assumed to come from household contributions in private tenure homes under CERO, based on evaluation evidence from Green Deal Communities and the Green Deal Home Improvement Fund. These both showed householder contribution rates comparable (and even higher) than those assumed here;
    b. while the remainder (£75m) is funding from other third party sources.

139. Householder contributions are only assumed in private tenure, where occupants are more likely to have access to capital such as savings.

140. In practice the assumptions used here on third party funding are likely to be conservative. The Scottish Government, for example, has announced £500m of extra funding is to be made available for energy efficiency in Scotland over the next four years – the equivalent of around £125m per year.[66] If, for example, just over half of this money were to be made available to blend with ECO, this single source of funding alone will exceed the total third party funding assumed across the whole of Great Britain for the extension scheme.

141. As the level of third party funding is a key uncertainty, a sensitivity analysis of the assumptions made has been undertaken in Section 10. Furthermore, the Department will closely monitor the costs of the scheme through the existing quarterly cost data collection, and be able to identify where supplier costs run ahead of those estimated in this Impact Assessment.

Customer contributions in the Affordable Warmth model

142. During the consultation period we gathered information from suppliers on the level of contribution towards the cost of measures under Affordable Warmth that they are seeking from

[65] Green Deal Communities money could be leveraged with ECO
[66] See http://www.gov.scot/Publications/2016/09/2860/7

customers, through the Energy Saving Advice Service (ESAS). Although a variety of approaches are taken it indicated that, in general, suppliers:

- ask for contributions towards the cost of installing replacement boilers, but not other measures;
- determine the level of contribution required by setting a benchmark cost effectiveness target (£/LTS). If the particular boiler installation is less cost effective than this target then the customer will be asked fund the difference. If it is more cost effective then the measure will be fully subsidised.

143. This is broadly in line with feedback received during the 2014 ECO consultation. We have limited evidence on the method used to determine the cost effectiveness target, and the proportion of customers that are willing to contribute the amount requested. We have therefore used a similar approach in modelling customer contributions to that used in the ECO 2014 impact assessment[67]:
    - The average cost effectiveness (£/LTS) per dwelling type is calculated based on remaining potential for the relevant measures, using deemed scores and installation costs
    - The cost effectiveness target is set for each measure as the £/LTS for the most cost effective dwelling type (i.e. lowest £/LTS across the dwelling types)
    - The amount of contribution required is calculated for each household as the amount required to achieve this target, based on their deemed score and installation costs
    - For some households the contribution required to bring them up to the cost effectiveness target will be significant, and given that by definition AW eligible households will be low income, it would be unreasonable to assume that all households are willing and able to pay this amount. We therefore assume (in the absence of further evidence) that the more a household is required to contribute, the lower the proportion of households that are willing to pay. We assume that this relationship is linear, with 100% of households willing to contribute £0 (for the most cost effective dwelling type), and 0% of households willing to pay the largest average contribution required (for the least cost effective dwelling type).

144. This approach is applied separately for the following different types of boiler replacement measure: qualifying gas boiler replacements, qualifying oil boiler replacements, and non-qualifying boiler replacements. For qualifying gas boiler replacements, this gives the input assumptions shown in Table B7, and the modelled contributions shown in Table B8:

Table B7: Customer contribution assumptions, Qualifying gas boiler replacements

Dwelling type	Average £/LTS (after deemed score uplift)	Average contribution required	Average % willing to pay the required contribution
Detached	0.13	£0	100%
Semi-detached	0.16	£394	25%
Terrace	0.16	£439	16%
Bungalow	0.16	£328	37%
Flat	0.20	£524	0%

[67] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373650/ECO_IA_with_SoS_e-sigf_v2.pdf

Table B8: Modelled customer contributions

Measure	Number contributing	Average contribution of those contributing
Qualifying gas boiler replacements	10,000	£190
Qualifying oil boiler replacements	900	£370
Non-qualifying boiler replacements	0 (none delivered)	£0 (none delivered)

Interest rates on private funding (opportunity cost of capital)

145. Where private funding is used to finance measures, this is a means of using private capital to achieve social aims. In the absence of ECO, this capital could have been invested elsewhere and achieved returns. These returns have therefore been forgone as a result of the capital being used to contribute to measures under ECO – there is an opportunity cost of capital.

146. The Committee on Climate Change have previously undertaken research on the appropriate means of estimating the opportunity cost of capital where private funds are used to achieve social aims.[68] They found that the appropriate interest rate for individual financing of social aims was in the region of 3.5% to 7.5%. We use the mid-point of this range, 5.5%, as the assumed private interest rate assumption (the consultation stage IA assumed an interest rate of around 7%, which was the assumed interest rate attached to a Green Deal loan).

Annex C - National Household Model (NHM)

147. The modelling approach remains largely unchanged since the publication of the consultation stage IA. However, the NHM modelling has been refined to use propensity scores (rather than a utility function) to choose homes that are most likely to install insulation measures under ECO.

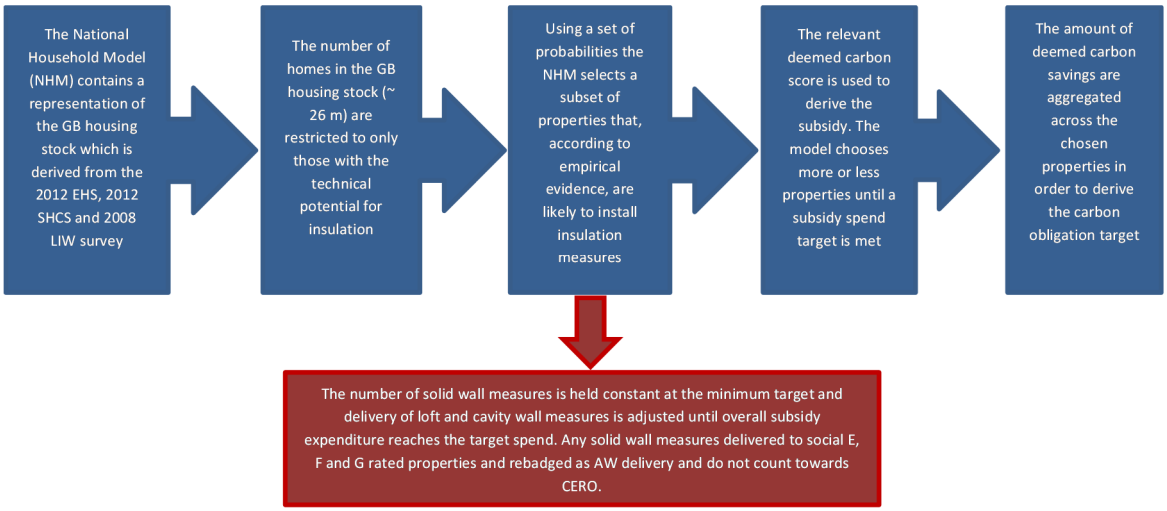
148. The propensity scores are calculated from historical delivery data spanning previous periods of ECO and the number of homes with technical potential for that measure. For example, over a given period of time against a particular level of CERO activity, there were 65,000 cavity wall measures delivered to owner occupied houses in a single year. At this point in time there were 1.8m owner occupied households that were suitable for cavity wall insulation. Therefore the propensity score is calculated as the number of measures delivered divided by the number with potential, or 3.6%.

149. The propensity scores assumed in this final stage IA are described in Annex B, as well as the improved evidence base that has been incorporated into the modelling.

150. Chart C1 provides a high level summary of the new methodology used to model CERO (see Annex D – pages 87-89 of the consultation stage IA for more detailed information on the NHM modelling approach).

[68] Available here: http://archive.theccc.org.uk/aws/Time%20prefernce,%20costs%20of%20capital%20and%20hiddencosts.pdf

Chart C1: High level summary of the Carbon Emission



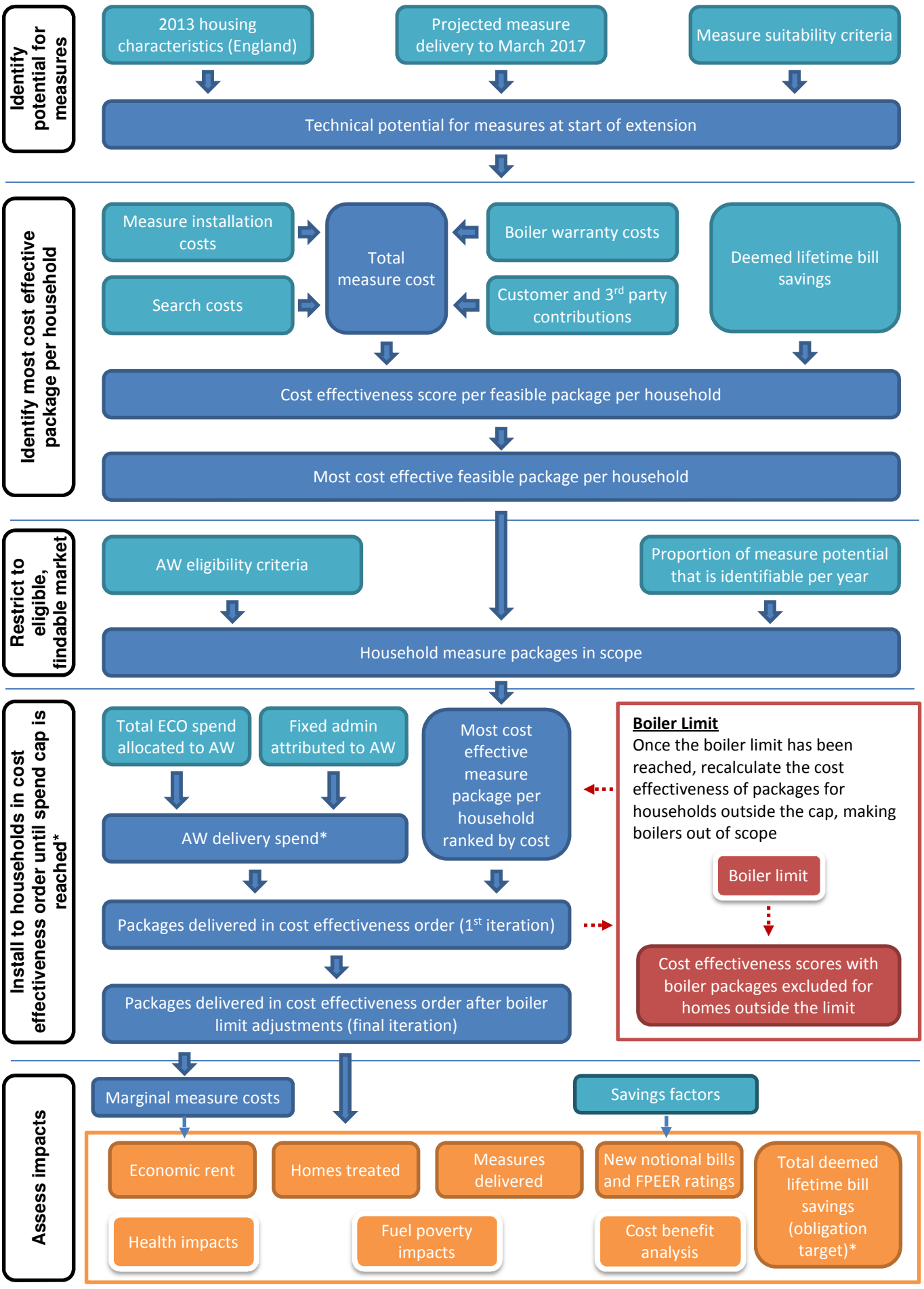
Annex D – Affordable Warmth Model

Model Overview

151. The Affordable Warmth model simulates the delivery of measures that reduce the cost of heating homes for households that meet the Affordable Warmth eligibility criteria. Chart D1 provides a high level summary of the modelling methodology applied in this Impact Assessment (see Annex E – pages 90-97 of the consultation stage IA for more detailed information on the AW modelling approach).

152. Since publication of the consultation stage IA the following improvements to the AW model have been made:

- The input data and assumptions have been updated to reflect improvements to the evidence base, as described in Annex B.
- Given changes to the CERO model, a new method for determining the proportion of technical potential that is identifiable each year under the 'high' scenario has been applied, where CERT SPG identification rates are now used. Additionally technical potential identification rates for SWI are now applied where previously it was unconstrained. Further details can be found in Annex B.
- Following consultee feedback, the AW model now segments qualifying gas boilers from other types of delivery. This reflects that, like solid wall insulation, the cap artificially constrains what would have been delivered in its absence. As a result, there is a different marginal cost for qualifying gas boilers compared to other measures.
- Some households are now assumed to contribute towards the cost of installing a replacement boiler. Further details can be found in Annex B.


Identify potential for measures
2013 housing characteristics (England)
Projected measure delivery to March 2017
Measure suitability criteria
Technical potential for measures at start of extension
Identify most cost effective package per household
Measure installation costs
Search costs
Total measure cost
Boiler warranty costs
Customer and 3rd party contributions
Deemed lifetime bill savings
Cost effectiveness score per feasible package per household
Most cost effective feasible package per household
Restrict to eligible, findable market
AW eligibility criteria
Proportion of measure potential that is identifiable per year
Household measure packages in scope
Install to households in cost effectiveness order until spend cap is reached*
Total ECO spend allocated to AW
Fixed admin attributed to AW
AW delivery spend*
Most cost effective measure package per household ranked by cost
Packages delivered in cost effectiveness order (1st iteration)
Packages delivered in cost effectiveness order after boiler limit adjustments (final iteration)
Boiler Limit
Once the boiler limit has been reached, recalculate the cost effectiveness of packages for households outside the cap, making boilers out of scope
Boiler limit
Cost effectiveness scores with boiler packages excluded for homes outside the limit
Assess impacts
Marginal measure costs
Savings factors
Economic rent
Homes treated
Measures delivered
New notional bills and FPEER ratings
Total deemed lifetime bill savings (obligation target)*
Health impacts
Fuel poverty impacts
Cost benefit analysis

Annex E – Step by Step guide to calculating the obligation targets

Affordable Warmth

153. During the consultation, a number of stakeholders requested simplified worked examples of how the ECO targets are derived. This Annex provides an indication of how the targets are calculated, which simplifies some of the detail involved in the micro-simulation modelling. As such, these are for illustration, and may not perfectly match the modelled results outlined in the above Impact Assessment at each step. Also, not all figures will sum due to rounding.

154. The Affordable Warmth target of £2.76bn lifetime notional bill savings for eligible households is underpinned by modelling based on cost-effective delivery of measures, as outlined in Annex D, above. The modelling indicates that the most cost-effective way of achieving this target would be to deliver just over 37,000 qualifying gas boiler replacements and around 275,000 other measures by the end of September 2018.

155. Tables E1 to E4 below provide a simplified example of the calculations involved in arriving at the £2.76bn target, based on delivery across the 18 month extension. Note that heating controls are not included as a separate measure in the tables as the capital costs and Lifetime Savings (LTS) in fuel costs are included within the values for first time central heating and boiler replacements for simplicity.

Table E1: Per measure costs (based on modelled delivery)

Measure	Capital cost, average (£)	Capital cost + search cost + warranties (£)	Capital cost after household and 3rd party contributions (£)
Cavity Wall Insulation	620	810	810
Loft Insulation	330	490	490
Solid Wall Insulation	7,560	7,740	3,870
First time central heating	2,200	2,720	2,720
Qualifying oil boiler replacement	6,670	7,100	7,060
Qualifying gas boiler replacement	1,760	1,940	1,830

Table E2: Lifetime savings and cost effectiveness

Measure	Average Lifetime bill Savings, after deemed score uplift (LTS)	Average effective cost per £LBS, after deemed score uplift (£/LTS)	Effective cost of most expensive package of measures delivered (£/LTS) – i.e. the marginal measure cost
Cavity Wall Insulation	10,300	0.08	0.23
Loft Insulation	4,200	0.12	
Solid Wall Insulation	24,100	0.16	
First time central heating	11,700	0.23	

Measure	Average Lifetime bill Savings, after deemed score uplift (LTS)	Average effective cost per £LBS, after deemed score uplift (£/LTS)	Effective cost of most expensive package of measures delivered (£/LTS) – i.e. the marginal measure cost
Qualifying oil boiler replacement	35,600	0.20	
Qualifying gas boiler replacement[69]	17,800	0.10	0.12

Table E3: Aggregated values

Measure	Number of measures delivered	Total capital cost (£m)	Total Lifetime Bill Savings (£m, LTS)
Cavity Wall Insulation	104,000	84	1073
Loft Insulation	148,000	73	624
Solid Wall Insulation	3,000	13	80
First time central heating	4,000	11	47
Qualifying oil boiler replacement	8,000	54	273
Qualifying gas boiler replacement	37,500	69	667[70]
Total	**305,000[71]**	**305**	**2760**

Table E4: Final Affordable Warmth values (2015 prices)

Category	Affordable Warmth values
Total Lifetime Bill Savings achieved	£2.76bn
Effective cost per £Lifetime Bill Savings - qualifying gas boilers	£0.12
Effective cost per £Lifetime Bill Savings - other measures	£0.23
Total capital cost (installation costs + search costs + warranties – customer contributions)	£305m
Total cost of achieving Lifetime Bill Savings using effective costs	£565m
Fixed admin costs apportioned to Affordable Warmth	£83m
Total cost of Affordable Warmth obligation	£647m

Carbon Emissions Reduction Obligation

156. This section of the IA provides a step by step guide to understand how the key CERO metrics were derived.

157. Table E5 shows the estimated carbprice for cavity, loft and solid wall insulation, which is based on observed (i.e., historical) prices under CERO for similar levels of market activity. As discussed in more detail in Annex F, below, a single market price is estimated for all non SWI measures (labelled (1) in the table below). For solid wall insulation, meanwhile, a higher market

[69] Qualifying gas boilers are split from other types of delivery, reflecting that, like solid wall insulation, the cap artificially constrains what would have been delivered in its absence and therefore creates a sub obligation within AW.
[70] This value includes scores from installing heating controls at the same time as the boiler, and is therefore slightly higher than the maximum bill savings that can be achieved under the qualifying gas boiler replacement cap (£660m LTS).
[71] This doesn't include heating controls as the installations costs and scores are already included in the values for the heating measures they are installed alongside, and is therefore slightly lower than the total number of measures estimated to be installed under AW (311,000)

price is estimated, reflecting that solid wall insulation is much higher up the CERO supply curve, and would not necessarily be delivered in the absence of the solid wall minimum.

158. Based on the estimated carbon price, the estimated measure costs, household and third party contributions and the households' willingness to install the measure (based on the propensity scores described in Annex B), the NHM is used to project the volume of measures that can be installed with the level of resources allocated to CERO (2), as well as the total deemed carbon savings from installing these measures (3).

Table E5: Measures delivered and supplier subsidy based on modelled delivery)

Measure	(1) Carbon Price per tonne	(2) Number of measures installed	(3) Deemed carbon savings (Mt CO_2)
Cavity Wall Insulation	£28	164,300	4.9
Loft Insulation	£28	85,100	1.1
Solid Wall Insulation	£55	28,285	1.3
Total	-	277,685	7.3

159. Table E6 similarly shows the supplier subsidy required per measure installed – this is the subsidy level required to induce the marginal household to install the measure. As suppliers are assumed to be unable to distinguish this household from other households, however, this level of subsidy is paid to all households installing measures, implying that many households are receiving economic rent (see Annex F for more details on economic rents).

160. Multiplying this supplier subsidy by the number of measures installed gives to total supplier subsidy of £240m (or £160m per year) (5).

Table E6: Number of measures delivered and aggregate subsidy and deemed carbon savings

Measure	(4) Supplier subsidy (per measure)	(5) Total Supplier Subsidy £m (2) x (4)
Cavity Wall Insulation	£837	137.5
Loft Insulation	£348	29.6
Solid Wall Insulation	£2,580	73.0
Total		240.1

Annex F – More details on the Categories of Costs and Benefits

Costs included in the cost benefit analysis

161. **Installation costs:** These cover the physical costs of the materials and labour required to install the energy efficiency measure in the home. We do not assume any reductions in the real costs of installations over time. Over time, technological improvements and increased competition may lower the costs of installing energy efficiency measures and therefore lower the costs of the policy. Similarly we do not assume costs increase over time, as it is assumed that the supply chain can meet the additional demand for energy efficiency measures without hitting supply chain constraints.[72]

[72] As all prices are in real 2015 prices, they are implicitly assumed to rise with inflation.

162. **Hidden costs[73]:** These include the time taken by householders to liaise with the installer, prepare the property for installation and any oversight, as well as clean-up or redecoration costs associated with the installation. These costs are estimated to be small in the majority of cases.

163. **Operational costs/expenditure (Opex):** Covers the annual cost of running heating measures, and includes servicing and maintenance costs, but not the fuel costs.

164. **Administrative costs:** In delivering their ECO extension obligation, suppliers will incur administrative costs. These will vary by supplier, depending on their setup[74], but include items from lead generation[75] to maintaining and running IT databases, and reporting measures installed to the administrator (Ofgem). They will also include indirect costs, such as a share of the suppliers' accommodation costs, Human Resources and legal costs.

165. Administration costs, as reported by suppliers, are around £85m per annum under the present ECO scheme. These costs are expected to fall under the extension period[76] by around £5m per year (according to a survey of obligated suppliers undertaken by the Department in early 2016), as a result of the proposals designed to reduce the administrative complexity of ECO.

166. **Additional search costs for Affordable Warmth:** Where suppliers are obligated to deliver measures to households eligible for AW support, they incur costs of not only identifying suitable properties but also in searching for eligible households and verifying they are indeed eligible. In many cases these costs will be first incurred by the installer who will pass on the costs to the supplier. This can entail paying third parties for referrals and additional specifically-targeted marketing, among other approaches.

167. **Natural boiler replacement cost savings (negative costs):** As outlined in Section 7, households are assumed to replace their boilers once they reach a certain age, with or without policy intervention. We refer to boiler replacements made by households rather than through policy intervention as 'natural replacements'. These replacements will be sourced and funded by individual households, which are likely to be more costly than if the replacement were installed through the supplier obligation. This is because individual households are not able to benefit from bulk delivery discounts that are available to suppliers and installers that can deploy boilers at scale.

168. We count the avoided costs of households replacing boilers themselves as a negative cost (i.e. a saving), and the cost of replacing boilers through Affordable Warmth as a positive cost.

169. More detail on the scheme's administrative costs are presented in Annex A.

Costs included in the distributional analysis

170. The following costs and benefits are treated as transfers between different groups in society, where the costs and benefits are equal to each other. They have therefore been excluded from the main cost benefit analysis in Section 9.

Supplier delivery costs (economic rents)

171. The presence of the market barriers and failures (discussed in Section 3) mean that suppliers must subsidise the installation and hidden costs of energy efficiency measures in order to

[73] See the ECOFYS (2009) "The hidden costs and benefits of domestic energy efficiency and carbon saving measures" report for further details http://webarchive.nationalarchives.gov.uk/20121217150421/http:/www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/saving_energy/analysis/1_20100111103046_e_@@_ecofyshiddencostandbenefitsdefrafinaldec2009.pdf

[74] For example, some suppliers may have their own installation arms, which may reduce the administration costs the supplier directly incurs.

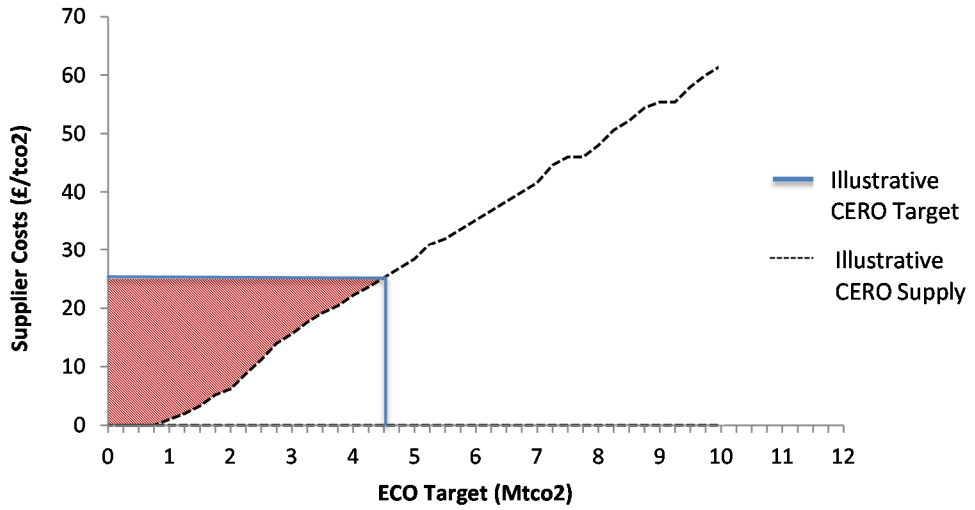
[75] Lead generation refers to the finding of ECO suitable households.

[76] The extent to which the administration costs might fall during the extension scheme is uncertain. We have therefore included supplier admin costs as one of the assumptions we vary in the sensitivities under Section 10.

induce eligible households to install measures. The larger the size of their ECO targets, typically the higher the subsidy levels suppliers have to offer in order to make the offer attractive enough for households to take up the required level of measures. As a result, suppliers may need to offer some households subsidy levels above that which they would normally need in order to take up measures. This 'excess subsidy' is referred to as 'economic rent', and can potentially accrue to the household, the installer, or the energy supplier.[77]

172. The concept of economic rents is illustrated in Chart 5 below, using CERO as an example. The blue vertical line shows the demand (from suppliers) for carbon savings in order to meet their CERO obligation. The upward sloping dotted black line, meanwhile, shows the supply of carbon savings, achieved by promoting and installing energy efficiency measures into ECO-eligible homes – the 'supply curve'. The supply curve is upward sloping because for low carbon targets, suppliers can promote and install the most cost effective measures, and can target the most amenable households. As the level of the carbon target increases, however, the more cost effective potential is exhausted, and suppliers have to pay larger subsidies to less amenable households; these act to increase the subsidy that suppliers have to pay.

Chart F1: Illustrative CERO Supply Curve



173. For the purposes of this IA it is assumed that suppliers cannot price discriminate between different households, in that they cannot infer the minimum subsidy level needed to induce each household to install energy efficiency measures. This means we assume that they pay the same subsidy to all households in order to meet their obligation, implying that some households are paid a subsidy larger than they would have needed in order to induce them to take up the measure (this is also counted as a benefit when undertaking distributional analysis – see section 9.1). This is illustrated by the shaded area in Chart F1, and represents an additional cost to suppliers in meeting their obligation.

Consumer bill impacts

174. Suppliers are assumed to pass the costs of delivering their obligation on to all of their customers through the variable element of gas and electricity prices. This cost pass through means that suppliers have an incentive to minimise the cost of delivering their obligation, as the greater the costs a supplier passes onto their consumers, the stronger the incentive their customers will have to switch suppliers. This would lose customers and potentially have a detrimental impact on a supplier's market share.

[77] If the householder demands or is offered a higher level of subsidy than they require, the rent will accrue to them. If an installer can persuade a household to accept a lower subsidy rate and sell the ECO compliance from the measures installed to the supplier at the higher subsidy rate, the rent will accrue to them. Alternatively, if a supplier funds the installation of measures at a level lower than they would ultimately be willing to offer, they could sell that compliance to another supplier and the rent would accrue to them.

Benefits

Benefits included in the cost-benefit analysis

175. Here we provide an overview of the monetised benefits included in the analysis, all of which are valued in line with the Green Book and supplementary guidance on valuing changes in energy and greenhouse gas emissions.[78]

176. **Energy Savings**: The installation of energy efficiency measures reduces the resources needed to meet the demand for energy services, such as heating. Energy savings mean fewer resources are required to meet energy demand for the lifetime of the measures installed. This is a benefit to society in the short run as it frees up energy to be used elsewhere immediately, but it also benefits society in the long run in that long term reductions in energy demand can bring down the long run variable costs of energy supply (for example, avoiding the need to build an extra power plant in order to provide electricity).

177. **Air Quality Improvements and Carbon Savings:** Similarly, lower energy use improves air quality and reduces carbon emissions.[79] Reductions in carbon emissions help meet the nation's Carbon Budgets, while improvements in air quality reduce adverse health impacts (including mortality and morbidity). Carbon savings are valued using the benchmark carbon values published in the Green Book supplementary guidance; while air quality improvements are valued using the relevant damage factors in the same publication.

178. **Comfort taking**: Efficient heating and insulation measures reduce the amount of energy required to heat the home (or in the case of first time central heating provide the means to fully heat the home for the first time). This means that following the installation, some households will choose to heat their homes to a higher temperature, for a longer period, or heat more rooms in the house. This can be measured in the form of a change in energy used to reach a higher temperature, and valued using the retail price of energy as this reflects a household's willingness to pay for the extra warmth.

Additional benefits assessed in distributional analysis

179. **Value to society of lower energy bills in low income households**: Energy bill savings are a private benefit – only the householder enjoys the direct benefits of paying less for energy. However, energy is a necessity and high energy costs faced by low income households can be regressive. When taking into account the distribution of energy bill savings, the benefit to low income households can be valued more highly than had the benefit flowed to those with higher incomes. This effect can be valued through the use of equity-weighting.[80] More detail is available in Annex C.

180. **Household contributions**: For some measures households are assumed to make contributions towards to the cost of their installation. Lower income households will place a higher value on their contributions than higher income households, due to their income constraints. This can also be monetised through the use of equity-weighting.

[78] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254083/2013_main_appraisal_guidance.pdf.

[79] Carbon savings are divided into those that are traded (i.e. emissions covered by the EU Emissions Trading System) and non-traded (i.e. emissions outside of the Emission Trading System). More details on the EU ETS can be found here: http://ec.europa.eu/clima/policies/ets/index_en.htm

[80] Equity-weighting is an approach outlined in the Green Book to monetising the distributional costs and benefits of policy options. It allows us to reflect that £1 of cost or benefit is worth more to those on lower disposable incomes than those in higher income groups.

181. **Wider benefits:** There are also likely to be a range of benefits associated with improved health outcomes[81], potentially savings for health service provision, and improvements in productivity that it has not been possible to monetise.

Annex G - Independent Supplier Assessment

Background

182. Energy suppliers are only obligated under ECO if they are over a certain size, meaning that many smaller, independent suppliers are exempt from ECO. This small supplier exemption recognises that ECO is likely to bear disproportionate costs of smaller suppliers of complying with ECO (due to the fixed costs of compliance), as they have a lower customer base to spread the costs of compliance. It is also consistent with Government regulatory guidance that small and micro businesses should be exempt from regulations unless the disproportionate burden these businesses face can be fully offset[82]

183. The minimum threshold for ECO meant that at the start of ECO in January 2013, only the Big Six[83] energy suppliers were obligated.

184. As ECO has progressed independent suppliers' domestic energy market share has grown significantly - from around 2% just prior to the launch of ECO in 2013 to around 18% towards the middle of 2016[84]. Growth in 2015 amongst the smaller suppliers has been supported by significant levels of switching, with 15% of customers changing suppliers, 40% of which were to independent suppliers, the highest level of switching since 2011[85].

185. The growth in independent suppliers meant that by the start of the second year of ECO 2 (April 2016 – March 2017, referred to as 'phase 2'), 6 independent suppliers had become sufficiently large[86] that they became obligated[87].

ECO Taper

186. The Government recognises that crossing the ECO threshold and becoming obligated can result in additional costs being borne by independent suppliers, and these costs will be passed onto their customers through their bills; it can also take time for suppliers to put the systems and expertise in place to deliver the obligation on a large scale.[88]

187. In recognition of the additional challenges faced by newly-obligated suppliers, ECO operates with a taper, whereby newly obligated suppliers are only obligated on the parts of their size that exceeds the ECO threshold. For example, the tapering approach means that where a supplier reaches 401 GWh of electricity, the full amount will not count towards its obligation share, only the volume above 400 GWh multiplied by 2 will count (i.e. only 2 GWh will count in this case).

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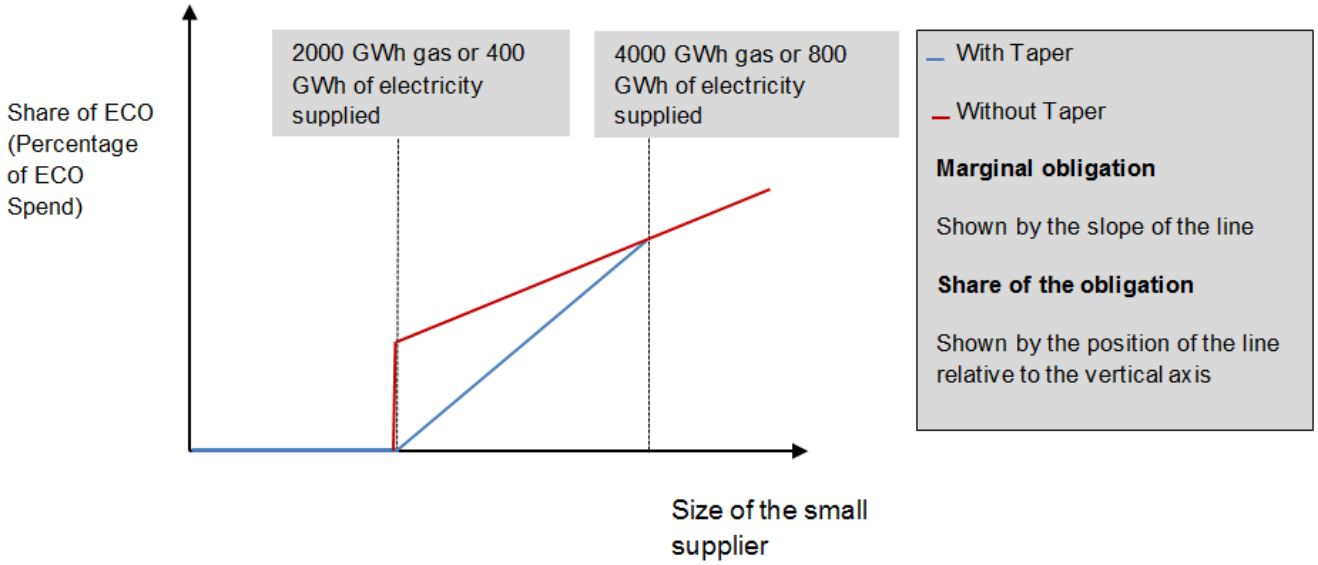
[81] Estimates of the monetised health impact for households of energy efficiency measures are included in Section 9.6; however the overlaps with comfort taking are at present unclear, therefore we do not include these benefits in the cost-benefit analysis to avoid double-counting.
[82] Source: Better Regulation Executive Guidance https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468831/bis-13-1038-Better-regulation-framework-manual.pdf (see page 27)
[83] The Big Six are British Gas, Scottish Power, SSE, E.ON, NPower, and EDF
[84] http://www.cornwallenergy.com/Opinion/Large-suppliers-stem-household-account-losses
[85] Source: Ofgem https://www.ofgem.gov.uk/publications-and-updates/more-consumers-are-shopping-around-over-six-million-energy-switches-2015-says-ofgem
[86] These suppliers now have between 500 – 1000 employees. This means that they no longer quality as small or micro businesses under the Better Regulation Executive definition – see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468831/bis-13-1038-Better-regulation-framework-manual.pdf (page 27)
[87] 11 suppliers were obligated for phase 1 of ECO 2 – RWE Npower, British Gas, EDF Energy, EON, SSE, Scottish Power, OVO, First Utility, Utilita, Co-operative Energy and Utility Warehouse
[88] Independent suppliers have the option of outsourcing some elements of the admin costs. However, some costs will still be incurred.

The full volume of supply is counted when the supplier reaches 800 GWh of electricity or 4,000 GWh of gas.

188. The impact of the ECO Taper is illustrated in the chart below. The red line shows how a newly obligated independent supplier's obligation share would grow assuming that ECO did not operate with a taper. Under this scenario, supplier's obligation share jumps upon crossing the threshold, and continues to grow in line with the growth in their market size. The blue line, meanwhile, shows how the obligation share changes with the taper. As can be seen, there is no sudden jump in their share of the obligation under this scenario – although newly-obligated suppliers see their obligation size grow more rapidly up until the upper 4000GWh limit as their market size grows.

Chart G1: Share of the obligation for a small supplier participating in the ECO



189. Some smaller suppliers have argued that the current level of the threshold and taper still represents a barrier to growth, and that in order for small suppliers to grow (and compete with the large, established suppliers) the threshold should be increased - or the taper extended. Conversely, the larger, established suppliers have argued that exempting small suppliers from the cost of delivering ECO gives them an unfair competitive advantage, arguing that the majority of ECO compliance costs are variable and that there is no evidence that the variable costs differ materially by size of supplier.

190. The Competition and Markets Authority (CMA) has considered whether the small supplier exemptions constitute an adverse effect on competition during its investigation into the retail energy market. In the CMA's decision on remedies report (published in March 2016), these exemptions are not stated as having an adverse effect on competition[89].

191. The provisional findings also suggest that the thresholds do not act as a material barrier to growth for small suppliers. This is supported by the number of suppliers that have crossed the threshold and continue to grow.

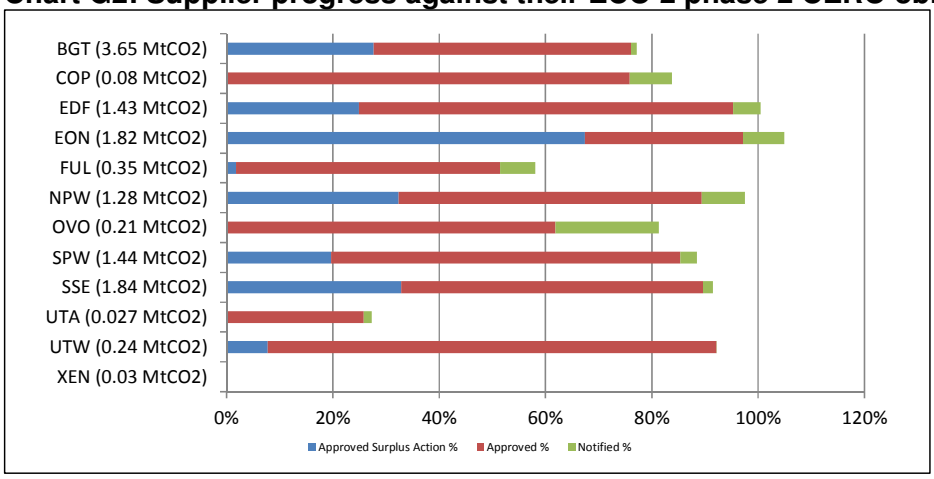
Performance of independent suppliers under ECO

192. Independent suppliers currently have around an 8% share of the obligations - around half of independent suppliers' overall market share[90].

[89] https://assets.digital.cabinet-office.gov.uk/media/56efe79040f0b60385000016/EMI_provisional_decision_on_remedies.pdf
[90] Customer account numbers for individual suppliers is not publically available, meaning it not possible to compare the obligated suppliers' market share to their share of the ECO obligation.

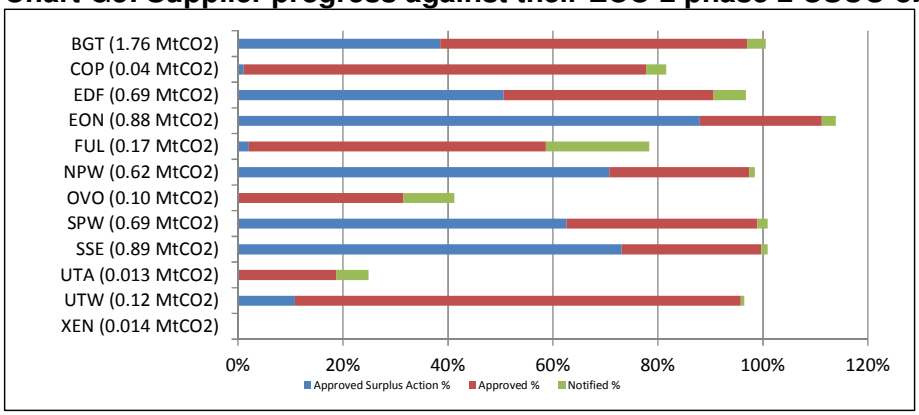
193. The charts below show the independent suppliers performance against their CERO, CSCO and Affordable Warmth targets respectively, showing that they have achieved over 70% of their CERO and CSCO targets and nearly 80% of the Affordable Warmth targets by August 2016, and suggesting they are broadly on course to meet their phase 2 obligations. Larger, more established suppliers are further ahead in their obligations. However, unlike the Big Six, independent suppliers have not benefitted, or only benefitted marginally, from surplus actions from ECO 1. As the CERO and AW targets are to be extended smaller suppliers will have until September 2018 to meet these extended targets.

Chart G2: Supplier progress against their ECO 2 phase 2 CERO obligation



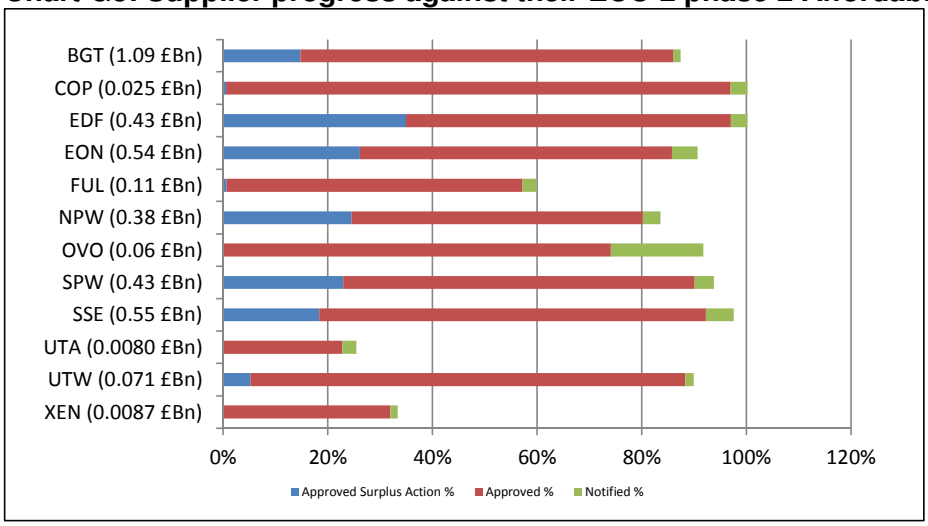
Source: Ofgem (measures notified to the end of August 2016)

Chart G3: Supplier progress against their ECO 2 phase 2 CSCO obligation



Source: Ofgem (measures notified to the end of August 2016)

Chart G3: Supplier progress against their ECO 2 phase 2 Affordable Warmth obligation



Source: Ofgem (measures notified to the end of August 2016)

Outlook for independent suppliers under the ECO extension

194. We are not proposing to alter the customer number account threshold during the ECO extension. Reducing the threshold would, as outlined above, bear down disproportionately on smaller suppliers who would be required to set up compliance mechanisms (for example IT systems) from scratch. Newly obligated suppliers would also need time to factor new costs into their tariffs. This is particularly important for suppliers offering fixed term, fixed price tariffs, who are not able to raise their prices. Any unanticipated changes in costs are more difficult for smaller suppliers to absorb as they have fewer customers over which to spread these costs and much smaller balance sheets than the large suppliers.

195. Increasing the threshold, meanwhile, would result in higher costs for obligated suppliers. Obligated suppliers would also need time to factor higher costs into their tariffs, but the larger obligated companies are more able to absorb these costs. Some of the smaller obligated suppliers, however, would find it more difficult to absorb these unanticipated costs.

196. Leaving the taper means that more independent suppliers are likely to cross the ECO threshold and become obligated under ECO. Due to the commercial restrictions on customer account numbers and the amount of electricity and gas supplied, it is not possible to provide an estimate for how many additional suppliers might be obligated during the ECO extension.

Annex H – Further modelling outputs

197. This section summarises the projected delivery of measures during the extension across tenure, fuel type, dwelling type, rurality and whether the dwelling is on or off the gas grid. The mix of measures delivered and the estimated delivery of these across different household characteristics should be read as illustrative only, as ECO regulations neither control nor regulate for this.

198. There is considerable uncertainty about what the actual distribution of measures will be, in part because it is not known whether historic delivery (on which the models have been calibrated) will be illustrative of future delivery, particularly given changes to the policy design. In addition, our modelling assumes that suppliers will target the cost-effective opportunities, whereas the extent to which suppliers are able to do so in practice is uncertain.

199. **Tenure.** The majority (around 70%) of measure uptake is estimated to be in the owner occupied sector (which also represents the latest tenure group of the housing stock), with a further fifth of measures installed in the private rental sector.

200. Delivery to privately rented homes is disproportionately high given the sector makes up around 18% of the stock. This is likely to be partly driven by private-rented homes being less energy efficient than other tenures, and therefore having disproportionately high cost-effective potential. In practice, delivery to this sector may be lower due to the known barrier of both landlord and tenant needing to agree to work being carried out. On the other hand the PRS Regulations may act as an incentive to deliver to privately rented homes.

201. It also reflects the focus of Affordable Warmth, where social housing is restricted to only the least efficient properties, and therefore the bulk of delivery by definition has to occur in private tenure housing.

Table H1: Estimated uptake of measures by housing tenure (April 2017 – Sept 2018)

Housing Tenure	AW	CERO	Total
Owner-occupied	55%	82%	68%
Rented (private)	34%	7%	21%
Rented (social)	11%	12%	12%

202. **Fuel type.** Table H2 shows around a fifth of delivery is estimated to be to households heated by non-gas fuels, broadly in line with the GB average (around 15% - 20% of households are heated using non-gas fuels, including electricity).

203. For Affordable Warmth suppliers have an additional incentive to deliver to non-gas fuelled households, due to uplifting the score achieved by delivering insulation measures and qualifying boiler replacements to non-gas fuelled households. These uplifts are in place because fuel poor households disproportionately use non-gas fuels to heat their homes. Tempering these incentives is the assumption that the cost of finding households with potential for delivery will be higher for those off the domestic gas grid.

Table H2: Estimated uptake of measures by heating fuel (April 2017 – Sept 2018)

Main Heating Fuel	AW	CERO	Total
Gas	81%	87%	84%
Electricity	13%	7%	10%
Oil	6%	5%	6%
Solid	1%	1%	1%

204. **Domestic Gas Grid.** The vast majority of delivery (over 80%) is estimated to be to households on the domestic gas grid, in line with the GB average. As above, the slight skew in delivery to off-gas grid properties under Affordable Warmth reflects our assumption that there are stronger incentives to deliver to non-gas fuelled properties because of their greater cost-effectiveness.

Table H3: Estimated uptake of measures by whether on gas grid (April 2017 – Sept 2018)

Gas grid status	AW	CERO	Total
Connected to gas grid	84%	89%	86%
Not connected to gas grid	16%	11%	14%

205. **Dwelling type.** Almost half of measures are predicted to be delivered to larger properties (detached and semi-detached), accounting for 47% of uptake. Again, this reflects our assumption that suppliers target the most cost-effective homes in delivering their obligations.

Table H4: Estimated uptake of measures by dwelling type (April 2017 – Sept 2018)

Dwelling type	AW	CERO	Total
Detached	17%	23%	20%
Semi Detached	27%	28%	27%
End Terrace	13%	9%	11%
Mid Terrace	20%	17%	19%
Bungalow	5%	11%	8%
Flat	18%	12%	15%

206. **Rurality.** Around 17% of delivery is projected to be to rural households.[91] Off the gas grid homes tend to also be in rural locations. Therefore the incentives that drive delivery to non-gas heated propertied have a similar effect in driving delivery towards rural homes. With around 15% of delivery under CERO currently going to rural locations, the CERO safeguard is not expected to be binding.

[91] Rural homes are defined as areas that are outside settlements of 10,000 or more. For more information see: https://www.gov.uk/government/collections/rural-urban-definition

Table H5: Estimated uptake of measures by rurality, preferred option (April 2017 – Sept 2018)

Rural status	AW	CERO	Total
Rural	18%	15%	17%
Urban	82%	85%	83%

Annex I – Non Monetised Impacts

Flexible eligibility

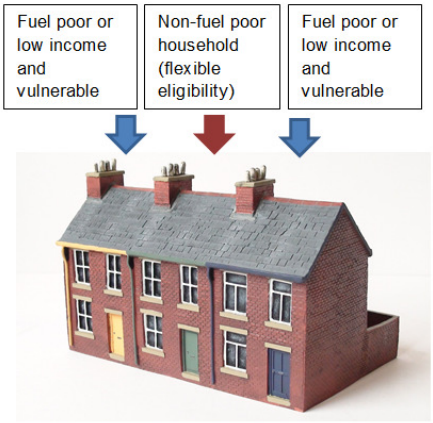
207. Improved eligibility criteria under Affordable Warmth will allow ECO to reach more, but not all, fuel poor homes. BEIS estimates that around 20% of fuel poor homes in England are not registered in the Government benefits or tax credits system, making their identification and eligibility for ECO support difficult. Others who may not be eligible may still be vulnerable to the effects of living in a cold home. The consultation therefore proposed to give power to Local Authorities, and potentially other trusted organisations, to use some discretion in determining eligibility under the scheme, allowing them to make use of their local data, knowledge and links.

208. This 'flexible eligibility' will provide for an optional route for delivery, rather than mandating it. This will enable more fuel poor or vulnerable households to be eligible without restricting the market from delivering in the most cost-effective way.

209. Consultation responses, where consultees expressed a view, supported some of the ECO Affordable Warmth extension target being eligible to be delivered through flexible eligibility. The Government has decided to allow up to 10% of the Affordable Warmth target for the extension period to be achieved in this way, to allow this mechanism to be tested during the extension. This may be increased in future once delivery routes have had time to establish and the government has confidence that this route aligns with the Governmnet's objectives. Following the consultation the Government has decided to only enable local authorities (rather than other organisations) to refer households under flexible eligibility. There are, however, several different ways flexible eligibility can work. For example, as well as allowing local authorities some discretion in determining households as fuel poor, LAs will be able to determine non fuel poor households as eligible for Affordable Warmth for the installation of solid wall insulation, where they live in private tenure flats, semi-detached properties, maisonettes and terraces, as long as a substantial proportion of households in any individual project are fuel poor or low income and vulnerable.

210. An illustration of how suppliers might use the flexibility in this manner is shown in I1. In the diagram, two non-adjacent households are eligible for Affordable Warmth, but the middle house is not. Under these circumstances, the energy supplier may be able to use flexible eligibility in order to treat the middle house, allowing all households to be treated. This is likely to be used where there are significant economies of scale in adopting a street-by-street approach.

I1: Example of the use of the flexible eligibility



211. The use of flexible eligibility is at the discretion of energy suppliers, meaning it is difficult to estimate how flexibility would affect the costs to suppliers of meeting their targets. However, since it is optional, and so suppliers would only use it where it is cost effective to do so, we would expect flexible eligibility to reduce the costs to suppliers of meeting their obligation.

212. The four main ways flexibility might lower the costs to suppliers of meeting their obligation are by:

1. **Reducing supplier search costs.** If Local Authorities identify households in fuel poverty and determine that they are eligible for Affordable Warmth, suppliers will have to spend less finding AW qualifying homes, reducing the costs to them of meeting their obligation targets.
2. **Increasing the eligible pool.** Related to the point above, flexible eligibility may increase the eligible pool offering suppliers more discretion in the homes they treat.
3. **Realising economies of scale.** Flexible eligibility will allow suppliers to treat multiple neighbouring homes with solid wall insulation, even if only some of them are eligible for Affordable Warmth.
4. **Reducing compliance costs**. Suppliers won't need to check eligibility with the Department of Work and Pensions, helping to reduce bureaucracy.

Justice Impact

213. There will not be a significant impact on the legal system or the volume of cases going through the courts, as BEIS is not making significant changes to the enforcement regime. The justice system would become involved were someone to seek to challenge an Ofgem enforcement action for a breach of the obligation or potentially where Ofgem were to seek a court order – although the latter has not occurred under supplier obligations since they began in the 1990s.