Department for
Business, Energy
& Industrial Strategy

ENERGY COMPANY OBLIGATION

ECO3: 2018 - 2022

Final Stage Impact Assessment

October 2018

Title: Final Stage Impact Assessment: ECO3 **IA No:** BEIS025(F)-18-HLE **RPC Reference No:** RPC-4226(2)-BEIS **Lead department or agency:** Department for Business, Energy and Industrial Strategy **Other departments or agencies:** None	**Impact Assessment (IA)** **Date: October 2018** **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
£718m	-£2,072m	£554m	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. Several market barriers and failures exist in the energy efficiency market, preventing the deployment of energy efficiency in the absence of Government intervention. These 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 low income and vulnerable 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; and 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 ECO for 3.5 years (to March 2022). End the carbon-focused Carbon Emissions Reduction Obligation (30% of ECO2t) and increase the Affordable Warmth (AW) part of the scheme (focused on low income and vulnerable households) from 70% to 100%.

The policy will also:

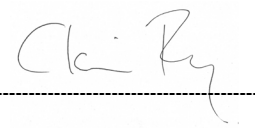
- Expand eligibility under AW to include disability-related benefits, and households in receipt of Child Benefit below an equivalised income threshold of £25,500 (for joint claimants with one child);
- Set a solid wall homes minimum, at the equivalent of treating 17,000 homes with solid walls per year;
- Increase the maximum number of broken heating system replacements to the equivalent of 35,000 per year (and remove coal boilers as an eligible measure);
- Increase the proportion of homes in rural areas that should be assisted to 15% of the whole scheme;
- Increase the percentage of the scheme that suppliers can deliver with local authorities (Flexible Eligibility) to 25%;
- Allow 10% of the scheme to be delivered through the promotion of innovative measures; and
- Reduce the supplier threshold (at which suppliers become obligated under ECO) in phases over the course of ECO3 to 150,000 customer accounts, but change the current tapering approach for suppliers when they initially become obligated.

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: -1.8**	**Non-traded:-9.3**

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

Signed by the responsible minister:  Date: 18.10.2018

Summary: Analysis & Evidence **Final Government Position**

Description: Extend ECO for 3.5 years from the end of September 2018 to March 2022. End the carbon-focused Carbon Emissions Reduction Obligation (30% of the ECO2t) and increase the Affordable Warmth (AW) part of the scheme (focused on low income and vulnerable households) from 70% to 100%. The policy will also: expand eligibility under AW to include disability-related benefits, and households in receipt of Child Benefit below an equivalised income threshold of £25,500 (for joint claimants with one child); set a solid wall homes minimum at the equivalent of treating 17,000 solid wall homes per year; cap heating system replacements at the equivalent of 35,000 per year (and remove coal boilers as an eligible measure); allow 10% of the scheme to be delivered through the promotion of innovative measures; protect rural delivery by ensuring that at least 15% of the obligation is delivered in rural locations; increase the proportion of delivery that can be delivered through Flexible Eligibility to 25%; and reduce the threshold above which suppliers become obligated under ECO in stages to 150,000 customer accounts.
FULL ECONOMIC ASSESSMENT

Price Base Year 2017	**PV Base Year** 2017	**Time Period Years: 46**	**Net Benefit (Present Value (PV)) (£m)**		
			Low: Optional	**High: Optional**	**Best Estimate: 718**

COSTS (£m)	**Total Transition** (Constant Price) Years	**Average Annual** (excl. Transition) (Constant	**Total Cost** (Present Value)
Low	Optional	Optional	**Optional**
High	Optional	Optional	**Optional**
Best Estimate			**1,624**

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, £1,192m), costs of ECO scheme administration to suppliers (PV, £175m), the search costs in finding eligible households (PV, £257m). Other costs include the hidden costs associated with the installation of energy efficiency measures (PV, £140m), the avoided costs to households of replacement boilers (PV, -£202m), the opex and boiler warranty costs (PV, £48m), the opportunity cost of households' co-funding measures (PV, £10m), and the costs to the administrator (PV, £5m). The vast majority of these costs are expected to be incurred by energy suppliers, which they are expected to recoup through their consumer's energy bills.

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

None identified.

BENEFITS (£m)	**Total Transition** (Constant Price) Years	**Average Annual** (excl. Transition) (Constant	**Total Benefit** (Present Value)
Low	Optional	Optional	**Optional**
High	Optional	Optional	**Optional**
Best Estimate			**2,342**

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 £1,272m), and increased comfort from warmer homes (PV, £305m). Society will also benefit from improved air quality (PV £99m), and reduced traded (PV £44m) and non-traded (PV £622m) 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, and health costs

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

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

When the distributional benefits are included, through equity weighting, the net present value increases to £4.3bn (an increase of 504% over the regular net present value, above).

BUSINESS ASSESSMENT (Final Government Position)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs:	**Benefits:**	**Net:**	
£554m	£0	**£554m**	**£1,940m**

1. Introduction

1. This final stage Impact Assessment (IA) accompanies the Government response on extending the Energy Company Obligation for 3.5 years, from autumn 2018 to the end of March 2022, with a focus on supporting low income, vulnerable 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 policy (hereafter referred to as ECO3).

2. Problem under Consideration

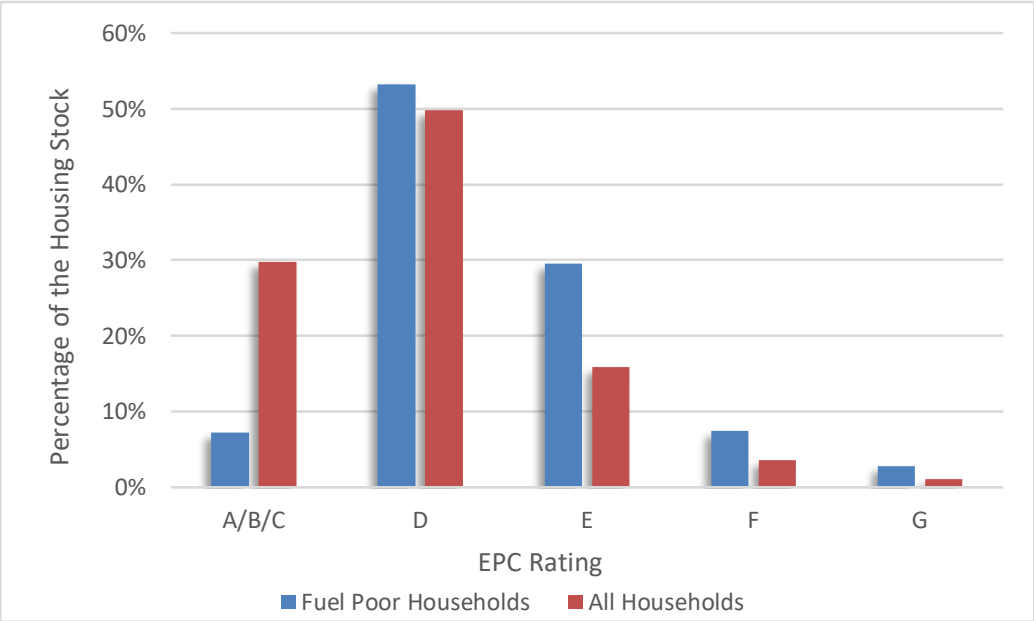
3. Upgrading the energy efficiency of homes addresses several Government objectives by directly:

   a. Tackling the root cause of fuel poverty and making progress towards the Government's statutory fuel poverty targets;
   b. Reducing greenhouse gas emissions in the domestic sector, contributing to the Government's legally-binding carbon reduction targets;
   c. Lowering energy bills, helping keep household energy bills as low as possible; and
   d. Reducing energy demand and helping ensure that the UK has a secure and resilient energy system.

4. Upgrading the energy efficiency of homes is the most effective way of tackling fuel poverty[1]. In England there are over 2.5m fuel poor households[2]. These households are disproportionately concentrated in the least energy efficient homes, with 40% of fuel poor households living in homes rated Energy Performance Certificate (EPC) Band E or below, compared to just half that among the wider housing stock[3]. In Scotland and Wales, around 13% and 25%[4,5] of the housing stock respectively fall into the lowest three energy efficiency bands. The Government has a statutory duty to raise as many fuel poor homes in England as reasonably practicable to energy efficiency Band C by 2030[6], with interim milestones of as many fuel poor homes in England as reasonably practicable to Band E by 2020 and Band D by 2025[7].

5. The energy efficiency of fuel poor households, compared to the overall housing stock, is shown in Figure 1, below.

Figure 1: Energy Efficiency Ratings of the English Residential Housing Stock (All Households and Fuel Poor)



[1] See, for example, the Marginal Alleviation Cost Curves presented in the ECO2t consultation stage IA https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/534669/ECO_Transition_Consultation_IA.PDF They show that installing measures such as loft and cavity wall insulation has a larger net societal benefit than bill rebates.
[2] https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018
[3] Ibid
[4] https://www.beta.gov.scot/publications/scottish-house-condition-survey-2016-key-findings/pages/5/
[5] Welsh EPC ratings are based on lodgements between 2017Q1 and 2018Q2 https://www.gov.uk/government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates (see table D1)
[6] 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
[7] 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. The poor energy efficiency of the GB housing stock is a symptom of low levels of insulation – even though insulation levels have improved significantly, over the last two decades, largely as a result of Government policies. For example, around 8m unique properties – nearly a third of the GB housing stock – have received loft, cavity or solid wall insulation under supplier obligations since 2002[8].

7. BEIS estimates that as of December 2017[9], across GB there were:

- Around 5.8 million properties that could benefit from loft insulation – mainly topping up existing levels of insulation (24% of homes with lofts)[10].
- Around 5.4 million cavity wall properties that could benefit from some cavity wall insulation (27% of homes with cavity walls).
- Around 7.8 million uninsulated solid walled properties (91% per cent of homes with solid walls).

8. The housing stock is responsible for a significant share of the UK's non-traded carbon emissions (around 23%)[11], and primary energy consumption (around 31%[12]). Therefore, tackling the poor energy efficiency of the housing stock is important in meeting the Government's legally-binding carbon targets.

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

- **Helping to lower household energy bills** - Households can save between £30 and £300 a year off their energy bills if they insulate their homes[13].

- **Reducing the costs of meeting energy demand** - International evidence suggests that energy efficiency (which reduces energy demand) can, in many cases, have a lower capital outlay and a lower levelised cost[14] than the alternative of constructing new fossil fuel or renewable generation to meet higher energy demand[15].

- **Improving 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[16].

- **Improving 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[17].

[8] Source: BEIS analysis of the Home Energy Efficiency Database and National Energy Efficiency Framework Database
[9] https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-march-2018
[10] This excludes the roughly 2.3m lofts deemed 'hard to treat' as some of these lofts are deemed 'unfillable'
[11] BEIS Greenhouse Gas Statistics, 2016 https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics
[12] Energy Consumption in the UK, 2016 https://www.gov.uk/government/statistics/energy-consumption-in-the-uk
[13] 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
[14] The levelised cost of energy is an attempt to measure different forms of generation on a comparable basis.
[15] International Energy Agency, Energy Efficiency Market Report (2015) http://www.iea.org/publications/freepublications/publication/MediumTermEnergyefficiencyMarketReport2015.pdf
[16] International Energy Agency, Energy Efficiency Market Report (2015) http://www.iea.org/publications/freepublications/publication/MediumTermEnergyefficiencyMarketReport2015.pdf
[17] 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

3. Rationale for Government Intervention

3.1 Market Barriers and Failures

10. 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[18]. To recap, the key market barriers and failures 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 (this is the 'opportunity cost'). This lack of access to capital will be particularly acute for low income, vulnerable and fuel poor households, which ECO3 is designed to assist[19].
- **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 (a landlord, for instance) may not be the same as those living in it (a tenant, for instance). 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[20]. 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

11. Intervention is also justified on the grounds of equity by tackling fuel poverty, those that are on a low income or are vulnerable, and improving health.

- **Fuel poverty**[21] - 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[22].
- **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[23], in addition to the Hills Fuel Poverty Review[24], set out the strong body of evidence linking low temperatures to these poor health outcomes.

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[18] For example, 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

[19] Where measures are installed into households in the private rented sector, it is possible that the landlord would have access to the capital necessary to undertake energy efficiency improvements. However, they will often lack the economic incentive to undertake the works, due to the misaligned incentives also discussed in this section.

[20] The carbon content of fuels is not included in their price. The exception is electrically-heated homes, as electricity generation is subject to the EU Emissions Trading System which places a price on carbon emissions generated.

[21] 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. Scotland recently announced that it would be changing its definition of fuel poverty. See: http://www.parliament.scot/Fuel%20Poverty%20(Target%20Definition%20and%20Strategy)%20(Scotland)%20Bill/SPBill37PMS052018.pdf

[22] Fuel Poverty Statistics (2018), available at: https://www.gov.uk/government/collections/fuel-poverty-statistics

[23] 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

[24] Hills (2011). *Fuel Poverty: The Problem and Its Measurement*. Available at: http://eprints.lse.ac.uk/39270/1/CASEreport69%28lsero%29.pdf

4. Policy Objectives

4.1 Transitioning to a Fully Low-Income Focused Supplier Obligation

12. ECO currently places an obligation on larger energy suppliers[25] to achieve carbon and notional bill savings by promoting and installing energy efficiency measures into domestic homes. Since its introduction, ECO has delivered over 2.3m measures to over 1.8m homes[26].

13. The phase of ECO prior to ECO3 (which was known as the ECO Transition – or ECO2t) began in April 2017 and ended in September 2018. It was designed to act as a transition between ECO2 (which ran between April 2015 and March 2017) and is comprised of a mixture of carbon and notional bill savings targets, and ECO3 (the subject of this IA), which is due to run from Autumn 2018 to March 2022, and is due to focus on helping low income, vulnerable and fuel-poor households.

14. The Transition was designed to gradually re-focus the scheme towards low income, vulnerable and fuel poor households, ahead of the scheme becoming fully focused on these groups from autumn 2018. This phasing in of the changes was designed to avoid a repeat the stop-start delivery seen, for example, when the Carbon Emissions Reduction Target (CERT) and Community Energy Saving Programme (CESP) ended and ECO (which had a different focus and scheme design) began at the start of 2013.

15. The ECO2t comprises 2 obligations:

- The **Carbon Emissions Reduction Obligation (CERO),** which seeks to reduce lifetime carbon emissions through the deployment of (primarily) insulation measures where they can be delivered most cost-effectively; and

- The **Affordable Warmth (AW) obligation**, which looks to reduce lifetime notional heating costs in low income and vulnerable households in or at risk of fuel poverty, through a mixture of insulation and efficient heating systems. Households can only receive measures under AW if they are in receipt of certain benefits.

16. Suppliers were also required to deliver a minimum share of their obligations through the deployment of Solid Wall Insulation (SWI), with the targets broadly the equivalent of treating around 21,000 homes per year. Further, they can only meet part of their Affordable Warmth obligation through the installation of replacement gas boilers, with a cap set at the equivalent of 25,000 boiler installations per year.

17. Under the Government's final policy design, the carbon focused Carbon Emissions Reduction Obligation (CERO) will end in September 2018. More details on the rationale for ending CERO can be found in Section 5.

4.2 Main Policy Objectives

18. As discussed above, the key outcomes are to put in place new regulations that focus ECO on low income, vulnerable and fuel poor households, reducing the energy bills of these households, and ensuring that the Government makes greater progress towards its statutory fuel poverty commitments; other outcomes of the scheme are to:

[25] This is set at over 250,000 customer accounts and delivering over 2000GWh of gas or 400GWh of electricity per year under ECO2t (although it will change under ECO3 - see section 5 for more information).
[26] Source Household Energy Efficiency National Statistics https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics#headline-releases

- Control supplier costs and achieve better value for money;
- Incentivise new, innovative measures;
- Give long-term certainty to support investment in the insulation and heating system supply chains;
- Promote collaboration with local actors[27]; and
- Align the policy approach with the long-term strategy around carbon budgets and tackling fuel poverty[28].

4.3 Broader policy objectives

18. Improving the thermal efficiency of domestic properties should improve internal comfort in domestic properties and reduce domestic demand for energy. These outcomes will help the Government to achieve its broader objectives to:

- Make progress towards its statutory fuel poverty targets;
- Reduce UK greenhouse gas emissions;
- Increase the security of energy supply (which also decreases peak demand and price volatility);
- Improve health outcomes related to living in cold homes; and
- Support economic growth, jobs in the green construction industry and investment in domestic dwellings.

[27] Organisations including local authorities, who have data about their residents and the condition of their housing stock.
[28] That is, continuing to deliver carbon savings by improving the energy efficiency of homes, while also tackling fuel poverty

5. Policy Options

5.1 Policy Option 0 – the 'Do Nothing' Option

19. Under this option, ECO ends at the end of September 2018 (at the end of ECO2t). This represents the counterfactual against which the costs and benefits of ECO3 are assessed. More detail on the counterfactual can be found in Section 7.

5.2 Final Government Position

20. The Government's final position broadly mirrors the proposals set out in the consultation. It involves ECO becoming a 100% Affordable Warmth scheme that focuses on low income, vulnerable and fuel poor households.

21. The Energy Company Obligation will continue for an additional 3.5 years, ending in March 2022. As the scheme will focus on low income, vulnerable and fuel poor households, the carbon-focused Carbon Emissions Reduction Obligation (CERO) will end in September 2018 (when the ECO2t scheme ends). All of the scheme (and thus supplier spending) from this point onwards would be focused on meeting the targets set under Affordable Warmth.

22. The policy also involves:

    a. Extending eligibility to households on disability benefits, and households in receipt of Child Benefit below an equalised income threshold of £25,500[29] (for a couple with one dependent child). This, along with removing the equivalised income thresholds for Working and Child Tax Credits, and Universal Credit, is estimated to lead to a pool size under ECO3 of around 6.6m[30] (compared to around 4.7m under ECO2t).

    b. Safeguarding rural delivery by requiring that a minimum of 15% of ECO3 is delivered to rural areas.

    c. Setting an obligation to treat a minimum number of solid walled homes to the same standard as installing solid wall insulation[31] (the solid wall homes minimum); this will be set at the equivalent of treating 17,000 solid wall homes with solid wall insulation per year.

    d. Including a cap on broken heating system replacements at the equivalent of 35,000 per year (replacing a cap on mains gas boiler replacements of 25,000 per year under the ECO2t scheme), while removing coal boilers as an eligible measure, and allowing inefficient heating systems (whether broken or not) to be replaced outside this cap where they are installed alongside qualifying insulation measures.

    e. Increasing the proportion of the scheme that can be delivered under local authority Flexible Eligibility to 25% (from 10% under the ECO2t scheme).

    f. Permitting up to 10% of ECO3 to be met through the delivery of innovative measures.

    g. Reducing the supplier threshold (at which suppliers become obligated under ECO) to 200,000 customer accounts from April 2019 and 150,000 customer accounts from April 2020[32].

23. Further rationale for the final policy position can also be found in Section 5.3; further details on the final policy design can be found in Annex A.

5.3 Rationale for the Government's Final Position

Increasing the focus on those that are on a low income or are vulnerable

[29] The equivalised income threshold is based on the equivalised income thresholds for ECO2t (£19,800) uprated with inflation.
[30] This represents a slight increase in the eligible pool from the 6.5m presented in the consultation stage IA. See Annex B for more information. The eligible pool size is based on BEIS analysis of the DWP benefit projections forecasts.
[31] This may be achieved by installing solid wall insulation, or a combination of other insulation measures that lead to the same energy efficiency improvement as solid wall insulation.
[32] The minimum supplier volumes, however, will be changed from the start of ECO3. See Section 11.

24. The Carbon Emissions Reduction Obligation was open to all households and therefore delivered greater carbon savings per pound of supplier spend[33,34]. However, the Government is committed to upgrading all fuel poor homes to EPC Band C by 2030. The Government considers that support should be focused on low income, vulnerable and fuel poor households so that they are able to live in properties that they can afford to keep warm at a reasonable cost. Based upon the equity considerations outlined above, the Government proposes to focus ECO3 on low income, vulnerable and fuel poor households. The impact of this is examined in Section 9, below.

The Rural Sub-obligation

25. The Government is also clear that households in rural locations should receive ECO measures, particularly as rural homes tend to have a higher proportion of households in fuel poverty[35] and have a larger fuel poverty gap[36]. To ensure that rural households receive ECO3 measures, the Government has proposed a rural sub-obligation, requiring that at least 15% of ECO3 is delivered to rural households.

26. There will continue to be incentives for rural delivery under ECO3. For example, the proposal to set a cap for the number of broken heating system replacements, a measure more prevalent in urban areas[37], is expected to incentivise the delivery of alternative measures in rural areas. Uplifts for non-gas fuelled homes will be retained for insulation measures and will continue to act as an incentive for delivery in rural properties. The Government will also continue to gather address-level data (as part of the data collection for the Household Energy Efficiency National Statistics) in rural areas to monitor rural delivery.

27. As outlined in Annex F, we estimate that nearly 20% of ECO3 delivery will be to rural locations, which is higher than the rural sub-obligation. This estimate is supported by delivery to rural households under ECO2t, which, between April 2017 and December 2017, has seen around 33% of Affordable Warmth measures delivered to rural locations (this falls to 20% when non-gas boilers are excluded[38]); therefore, the rural sub-obligation is not expected to increase the costs of delivering ECO3.

Solid Wall Homes Minimum

28. Improving the energy efficiency of solid walled homes is a significant challenge for the nation's housing stock, but essential to meeting our statutory emissions reduction goals and to delivering the ambition of the Clean Growth Strategy. There are an estimated 8.5 million homes of solid wall construction in Great Britain but less than 10% currently have been insulated[39]. Those living in fuel poverty are disproportionately affected - for example, while approximately 25% of non-fuel poor English households have uninsulated solid walls, 41% of homes occupied by fuel poor households have uninsulated solid walls[40]. Whilst these homes are considerably more

[33] This is because suppliers can target the most cost-effective homes, and are expected to have lower search costs per home treated (see Annex D for more information on search costs). This means they can treat more homes within the available supplier envelope compared with Affordable Warmth.
[34] For example, the final stage IA estimated that CERO would treat around 245,000 homes compared to 300,000 under Affordable Warmth, despite CERO constituting around 30% of ECO2T spending (compared to 70% for Affordable Warmth). Similarly, CERO was expected to make up around 80% of the carbon savings expected from ECO2T over Carbon Budget 5 (2028-2032).
[35] The incidence of fuel poverty in rural locations is around 13%, compared to around 11% in semi-rural and urban locations. See table 5 of the 2018 fuel poverty statistics https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018
[36] The fuel poverty gap is a measure of the additional fuel costs (in pounds) a household would need to move out of fuel poverty. The fuel poverty gap is £625 in rural locations, £333 in semi-rural locations and £289 in urban locations. Source: Ibid.
[37] BEIS analysis of supplier delivery data, as reported within the Household Energy Efficiency National Statistics https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics . The higher prevalence of heating system replacements (which has historically been gas boiler replacements) in urban areas is likely to reflect the fact that there are more homes in urban areas (around 19m homes are classified as 'Urban' in England, compared to 4m classified as 'Semi Rural' or 'Rural' (source: https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018) and that urban areas are more likely to be connected to the gas grid.
[38] Source: BEIS analysis of the data underpinning the department's Household Energy Efficiency National Statistics.
[39] https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-march-2018
[40] https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018

expensive to insulate to a good standard, doing so will help us tackle fuel poverty and meet our longer-term carbon reduction targets. Ongoing support (through ECO) will help sustain the solid wall insulation supply chain[41], helping ensure the Government meets both objectives.

29. Solid walls cost an average of £8,000 per household to insulate. We need to bring down the cost of this important technology. While the Government wants to continue to treat these homes, it recognises that ECO funds are finite and that there are other measures (which are generally more socially cost effective) that it wishes to support.

30. The Government has therefore decided to reduce the minimum requirement from providing solid wall insulation to 21,000 homes per annum under ECO2t to treating 17,000 solid walled properties with either solid wall insulation, or a combination of measures that achieve the same energy efficiency improvement as solid wall insulation, under ECO3. This is because in certain circumstances a combination of measures rather than solid wall insulation could be more appropriate and cost-effective to install whilst achieving the same level of bill savings.

31. This IA assumes that all solid wall homes are treated with solid wall insulation, as BEIS analysis of English Housing Survey suggests that, in most cases, solid wall insulation will deliver greater savings than alternative packages of measures, and because of the co-funding available to suppliers when installing solid wall insulation (see Annex B).

32. However, BEIS acknowledges that there may be some instances when it is more cost effective for suppliers to install packages of measures in solid wall homes rather than solid wall insulation. As this would deliver at least the same level of savings as solid wall insulation, meaning the same progress against the solid wall homes minimum, it would serve to reduce the costs of meeting the minimum.

33. The final target under the solid wall homes minimum has been set at £0.721bn notional lifetime bill savings.

Increasing the Eligible Pool and Removing Equivalised Income Thresholds

34. Over the period 2017 to 2022, the total number of eligible households, using the ECO2t scheme eligibility criteria, was expected to decline by around 25%, from 4.7m to 3.5m households, due to forecast changes in eligible benefit caseloads[42,43].

35. This reduction in the ECO2t eligible pool was expected to increase the search costs associated with finding eligible homes, and thus reduce the number of properties that could be treated within the supplier spend envelope of £640m per annum[44]. Increasing the size of the pool (to 6.6m households, excluding those treated under Flexible Eligibility and Innovation[45]) by extending eligibility to disability benefit claimants and households in receipt of Child Benefit below an equivalised income of £25,500 (for joint claimants with one child) will help ensure that the ECO3 will target low income, vulnerable and fuel poor households, while also ensuring search costs are manageable for suppliers[46].

[41] The solid wall insulation supply chain receives the majority of its work through supplier obligations, so (more than the supply chain for other ECO measures) is reliant on ECO activity to sustain their business. See, for example, the CERT Evaluation (page 60) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350722/CERT_CESP_Evaluation_FINAL_Report.pdf.

[42] Source: DWP

[43] Benefit caseloads are the number of households or individuals in receipt of a particular benefit

[44] Updated search cost assumptions are presented in this IA in Annex B

[45] See Annexes I and J for more information on Flexible Eligibility and Innovation.

[46] As outlined in Annex B, the equity weights have been increased since the consultation stage IA, which (all else equal) would have increased the equity weighted NPVs of all of the options outlined in the consultation stage IA, particularly the option with the narrowest pool. Despite this, BEIS believes that the search costs of finding and treating eligible homes could have become prohibitive had the pool size been reduced to 3.5m (as per the consultation IA's option (2)). Section B, for example, shows that the department has doubled its search cost assumptions for the final policy design with a 6.6m pool. BEIS would expect these to be higher still under a smaller pool, which would reduce the equity weighted NPV. Section 10 also shows that reducing the assumed 'findability' of eligible households can substantially increase the supplier spend needed in order to meet the targets.

36. By broadening the eligible pool of households and delivering more measures overall, the policy makes greater progress towards the Government's commitment, set out in the Clean Growth Strategy[47] and the Fuel Poverty Strategy[48], to bring as many fuel poor households as is reasonably practicable up to EPC[49] Band C by 2030.

37. Working and Child Tax Credit, and Universal Credit, fall under the Government's benefits cap, which restricts the total amount of money a non-working household can receive to the level of the average earned income of working households after tax and national insurance contributions are deducted.

38. As the cap on benefits is lower than the ECO2t Affordable Warmth equivalised income thresholds[50], there is no need for a threshold for these benefits, and so they have been removed under ECO3. This will also enable easier and simplified data matching with DWP data under the scheme.

A Cap for Broken Heating System Replacements

39. The ECO2t boiler cap of 25,000 reflected that 70% of the scheme was focused on Affordable Warmth. With ECO3 becoming 100% focused on low income, vulnerable and fuel poor households, increasing the cap to 35,000 partly reflects a pro rata increase in Affordable Warmth spending (from 70% to 100%).

40. BEIS considers that insulation is the best long-term solution to reducing energy costs and fuel poverty[51]. The Government would like this to be reflected in scheme delivery by continuing to limit certain heating replacements and repairs. However, low income, vulnerable and fuel poor households with broken heating systems may be unable to repair or replace them with a functioning system. Therefore, the Government wants to ensure that these households can have their broken heating system replaced under ECO3, helping to prevent them from experiencing the negative health impacts associated with living in a cold home[52].

41. There is evidence that there is additionality from installing boilers under Affordable Warmth (see Section 7.2, below), and that this has helped people who are often unable to replace their broken boilers for some considerable period. BEIS analysis of the English Housing Survey[53] and Fuel Poverty Statistics[54] suggests that low income, vulnerable and fuel poor households typically replace their boilers after around 15 years, which is 3 years longer the typical lifetime of a boiler, and 5 years later than non-fuel poor households[55]. Intervening at the point that a boiler has broken can avoid these households 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 financial means to replace it – such as using expensive plug-in heaters for warmth and a kettle for hot water[56].

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[47] https://www.gov.uk/government/publications/clean-growth-strategy
[48] https://www.gov.uk/government/publications/cutting-the-cost-of-keeping-warm
[49] EPCs (or Energy Performance Certificates) provide an assessment on how energy efficient a property is, and ranges from A ratings (the most efficient) to G (the least); more information on EPCs can be found here http://www.energysavingtrust.org.uk/home-energy-efficiency/energy-performance-certificates
[50] The equivalised income threshold for a couple with dependent children would be around £25,500 if it was not removed, compared to a benefits cap of around £20,000 (£23,000 in Greater London) for a couple with dependent children
[51] See, for example, Chart 2 (page 10) of the consultation stage IA for the ECO2t https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/534669/ECO_Transition_Consultation_IA.PDF . This Fuel Poverty Marginal Alleviation Cost Curve shows that insulation is the most socially cost effective way to make progress towards the 2020 interim milestone (to move as many fuel poverty households as reasonably practicable to Band E by 2020).
[52] Health Outcomes are discussed on page 3.
[53] https://www.gov.uk/government/collections/english-housing-survey
[54] https://www.gov.uk/government/collections/fuel-poverty-statistics
[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

42. Broken heating system replacements will continue to be limited to private tenures. 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.

Retaining oil boilers

43. The Government has set out the long-term vision on clean growth including the commitment to phase out carbon intensive fuels from 2020, starting with new homes. The Government acknowledges, however, concerns received during the consultation, on how a complete restriction from Autumn 2018 (before the phasing out starts), could impact on off-grid low income, vulnerable and fuel poor households. It will therefore allow oil boilers to be delivered under the broken heating system cap and will allow the repair of broken oil boilers, within the 5% cap for all boiler repairs.

44. Coal heating replacement or repairs will not be allowed under ECO3, as these have particularly high carbon intensities[57]. Oil boilers will not be allowed under first time central heating (FTCH), district heating, solid walled homes minimum, rural minimum, inefficient heating systems or innovation measures.

45. Oil boilers will receive a 400% uplift under the broken heating system cap[58]. However, while Government expects that oil boilers will be delivered in rural areas, they will not be counted towards the rural minimum, nor will they receive the 45% off gas grid uplift they currently receive under ECO2t. This is to encourage primarily insulation measures, which, as outlined above, are deemed the best long-term solution for fuel poor households, and the Government does not want to over incentivise suppliers to install oil boilers at the expense of other ECO measures.

46. Off-gas insulation, however, will continue to receive a 35% uplift, which will incentivise delivery to rural locations. See the 'Uplifts' below, and Annex A, for more information.

47. The Government believes that this will provide support to low income, vulnerable and fuel poor households to replace broken oil heating systems until March 2022 while complementing the longer-term objective set out in the Clean Growth Strategy.

Allowing Suppliers to Deliver Up to 10% of their Obligation through Innovation

48. Meeting the Government's fuel poverty commitments and abating its carbon emissions at the lowest possible cost will require new, lower cost products, as well as methods for installing them. Allowing up to 10% of the scheme to be delivered though two innovation routes (Demonstration Actions and Innovation Score Uplifts) will allow the promotion and installation of new, innovative products and methods to help to achieve these aims, while continuing to ensure that homes benefit from the delivery of energy efficiency measures.

49. Demonstration Actions provides financial support from suppliers for measures that have been tested in a laboratory and that now require wider testing in a live environment.

50. Innovation score uplifts have been introduced for measures that have not previously been delivered under ECO. No new measures have been introduced since ECO started and so suppliers need an incentive to introduce and deliver new, innovative products, as suppliers are not expected to deliver these without an incentive. This may be due to the higher costs associated with introducing these new products into the scheme.

51. Providing an innovation score uplift for the measure may also reflect additional benefits associated with these measures, which could include (compared to standard measures): lower bills for households or greater levels of thermal comfort due to the measures improved fabric; reduced

[57] Coal's carbon intensity is around 40% higher per KWh of energy consumed as oil and around 80% higher than gas. Source: BEIS Green book supplementary guidance, table 2a https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

[58] This reflects that, like gas boilers, which also receive a 400% uplift, only 3 of the 12-year natural lifetime of the boiler are considered additional when installed under ECO (as the household is assumed to install the measure in the absence of ECO after 3 years). These shortened lifetimes are used in the ECO deemed scores, and mean the deemed scores are low relative to other measures. Therefore, in order to ensure these measures, remain broadly cost competitive they receive an uplift of 400%, bringing them into line with their natural lifetime.

costs of delivering the measures due to improved installation techniques; spill over effects into the wider economy, including increased employment and skill levels for new, smaller manufacturers and installers; improved appearance. More details on Innovation can be found in Annexes A and J.

Increasing the Size of Flexible Eligibility

52. Ten percent of the ECO2t Affordable Warmth target can be met through Flexible Eligibility. Since its introduction in April 2017, Statements of Intent[59], covering around 200 local authorities, have been published, indicating strong interest amongst local authorities for Flexible Eligibility.

53. The Flexible Eligibility cap will be increased to 25% under ECO3. This decision reflects feedback from stakeholders and consultation responses that the ECO2t 10% cap did not provide sufficient incentive for some local authorities to participate in the scheme, as the size of the projects were typically too small to be deemed value for money. The increased cap should lead to suppliers working with more local authorities to deliver measures.

54. Flexible Eligibility is designed to harness the knowledge that local authorities have about the low income, vulnerable and fuel poor households that live in their areas, allowing ECO funding to be better targeted at those that need it most. BEIS expects Flexible Eligibility to reduce search costs associated with delivering ECO, increasing the scheme's cost effectiveness.

55. More details on the impact of Flexible Eligibility can be found in Annex I.

Deemed Scores

56. Suppliers must deliver measures to eligible homes to meet their obligations. Installing a particular measure in a particular type of home is awarded a 'deemed score' based on the estimated notional bill savings that the measure is expected to deliver over the measure's lifetime. These scores are designed to act as a proxy for the score a household would receive had the property undergone an assessment using the Standard Assessment Procedure (SAP) or Reduced Data Standard Assessment Procedure (rdSAP)[60]. ECO used SAP until the end of March 2017, when deemed scores were introduced to reduce the scheme administration costs and the scheme's complexity.

57. The deemed scores proposed for ECO3 have been adapted from those under ECO2t to reflect the Building Research Establishment updates to rdSAP in November 2017. District Heating will continue to use SAP to derive their bill savings, as the bill savings from these types of installations can vary significantly, making a deemed score for such installations inappropriate. Ofgem has also used evidence from Boiler Plus Regulations[61] to revise the deemed scores for gas boiler upgrades to reflect increases in efficiency standards. Lifetime assumptions are expected to remain the same, except for broken boiler lifetimes, which are now assumed to be 3 years which will consequently reduce the deemed score lifetime bill saving. BEIS has introduced an uplift to ensure suppliers are sufficiently incentivised to upgrade broken boilers as the Affordable Warmth modelling shows that relatively few broken boilers would be replaced without an uplift.

Uplifts

58. BEIS analysis suggests an uplift is required to make broken boiler replacement measures more cost effective to deliver. Without it, the analysis suggests delivery will fall significantly short of this cap and homes with broken boilers will be left without ECO support. This uplift (which also featured in the deemed scores for ECO2t) has been accounted for in Ofgem's revisions to the

[59] A Statement of Intent states publicly the criteria that an LA, or a group of LAs, intends to use to identify households that meet the eligibility criteria under flexible eligibility.

[60] More information can be found here: https://www.gov.uk/guidance/standard-assessment-procedure

[61] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651853/Boiler_Plus_final_policy_and_consultation_response.pdf

deemed scores for broken boilers. BEIS will also apply an uplift to broken electric storage heating measures to ensure households with these measures also receive support. These uplifts are accounted for in the modelling outlined in Section 6.

59. A 30% uplift to all deemed scores was introduced under ECO2t to provide parity between the ECO2 SAP based scores and the lower EC2t deemed scores. Without the uplift, there would have been a large incentive for over delivery under ECO2 (the scheme to March 2017), because they would get a better score per property treated, and consequently fewer measures would have been installed under ECO2t. The ECO2t uplift will be removed for ECO3 as over delivery has been capped under CERO at 20% of the scheme[62], and so suppliers have less of an incentive to over deliver against their ECO2t targets.

60. Uplifts will also be awarded where:

- **Suppliers treat an F or G rated owner occupier home under Flexible Eligibility**. This is intended to incentivise suppliers to target the least energy efficient properties and reflects the principles of the Fuel Poverty Strategy to treat the worst properties first. As outlined in Section 2, households living in the lowest EPC rated properties are also more likely to be in fuel poverty. Thus, this is expected to increase the number of fuel poor homes treated under the scheme.
- **The delivery of innovative measures under Innovation Score Uplifts.** This uplift is to incentivise the uptake of new, innovative measures. More details can be found in Annex J.
- **Off gas grid delivery**. The scheme will retain a 35% uplift for delivering insulation measures to off gas grid homes, reflecting that these households are more likely to be in fuel poverty and experience a larger fuel poverty gap[63]. The uplift should incentivise delivery to rural locations, helping suppliers to deliver their rural minimum. However, the uplift will be removed for heating measures to ensure that they do not crowd out delivery of other measures to rural locations.

61. As described in the section on retaining oil boilers, suppliers can also claim an uplift for when installing broken boilers.

62. Suppliers will only be able to claim one of these uplifts, of their choosing, per measure. This is to prevent suppliers from claiming multiple uplifts per measure.

Supplier Threshold

63. The customer threshold will remain the same as for ECO2t for the first phase of the scheme (from the start of the scheme until March 2019), although the minimum volumes of gas and electricity supplied to become obligated will decrease (increase) from 2000GWh to 1,400GWh (400 GWh to 500 GWh) respectively[64]. The Government will reduce the supplier obligation threshold from 1 April 2019 of ECO3 to 200,000 customer accounts and supply volumes of 1,100GWh of gas and 400GWh of electricity, and then 150,000 customer accounts and supply volumes of 700 GWh of gas and 300GWh electricity from 1 April 2020 and for the remainder of the scheme.

64. More analysis and justification for lowering the ECO threshold is provided in the small and micro business assessment provided in Section 11.

5.4 Targets for Obligated Suppliers

[62] While CERO is ending at the end of September 2018, suppliers will be able to carry over eligible measures to ECO3. The formula for converting carbon savings under CERO to equivalent lifetime bill savings under Affordable Warmth, will be determined by Ofgem.

[63] 16% of homes off the gas grid are in fuel poverty, compared to 10% on the gas grid. The average fuel poverty gap, meanwhile for off gas grid homes is £543, compared to £275 for homes on the gas grid. Source: https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018 (see table 10)

[64] This is to reflect changes in average supply volumes in the domestic energy retail market since the start of the scheme in 2013.

65. The final targets for ECO3 are:

a. The Affordable Warmth target is £8.253bn in notional lifetime bill savings to be achieved by March 2022 (15%, or £1.238bn, of which must be delivered to rural areas);

b. A solid wall homes minimum: £0.721bn notional lifetime bill savings (broadly equivalent to the installation of 17,000 SWI per year – or 60,000 solid walls being insulated over the period October 2018 to March 2022); and

c. A limit on the replacement of broken heating systems: £1.735bn notional lifetime bill savings (broadly equivalent to just over 35,000 heating systems per year – or around 120,000 over the lifetime of the policy).

62. The overall target for suppliers has increased from £7.8bn in the consultation stage IA. This largely reflects the changes to the evidence base and assumptions outlined in Section 6.2.

6. Analytical Approach

66. This section of the IA outlines the way that the policy options have been appraised. The aim of the analysis is to:

    a. Estimate the uptake of energy efficiency measures within domestic dwellings during ECO3;
    b. Assess the impact of the policy, in terms of energy saved, the carbon abatement, improvement in air quality, and health impacts;
    c. Estimate the distributional impact of the policy, including the costs to energy suppliers and bill payers; and
    d. Estimate progress against fuel poverty targets.

67. The impacts have been appraised according to Green Book[65] and supplementary guidance[66] and are presented in discounted real 2017 prices, against a counterfactual of ECO ending in September 2018.

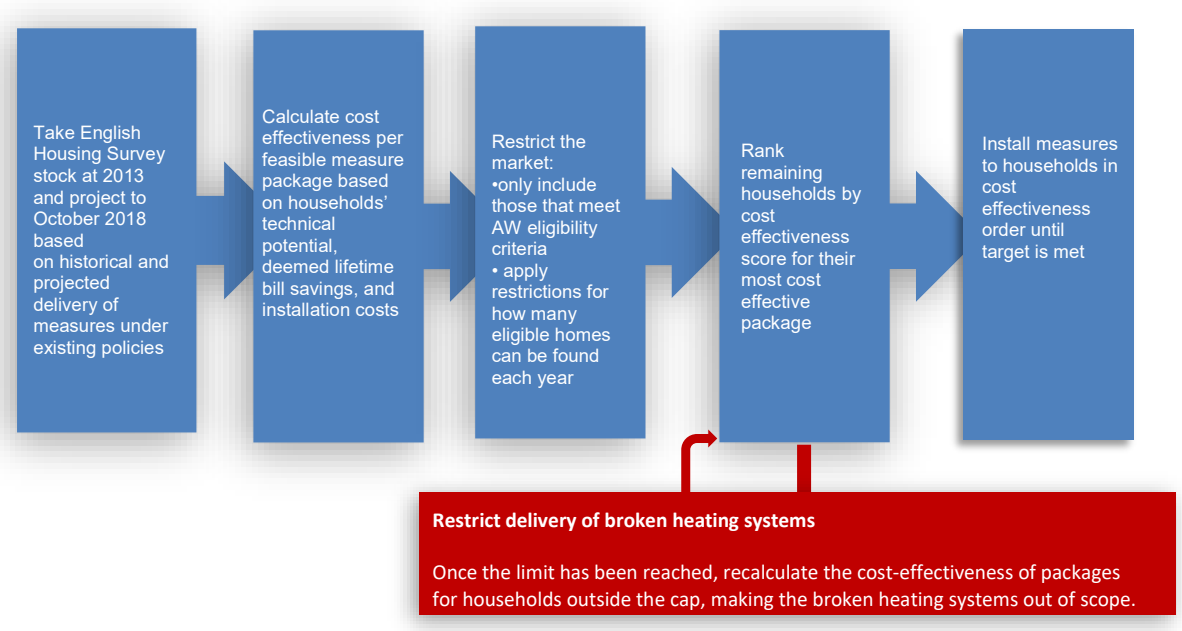
68. BEIS has used its Affordable Warmth (AW) model to analyse the impacts of ECO3.

69. The AW model simulates the delivery of measures that reduce the cost of notional heating costs for households that meet the Affordable Warmth eligibility criteria. It is an Excel-based micro simulation model, and simulates take-up of heating and insulation measure packages in different households. It uses the English Housing Survey and fuel poverty supplementary dataset, with weights applied to make the housing stock broadly representative of Britain.

70. The model simulates uptake based on the relative cost-effectiveness of single measures or packages in reducing notional energy bills. Measure packages are delivered in cost-effectiveness order until the proposed obligation target has been reached. The total notional lifetime bill savings from delivering these packages is an output from the model, which is used to set the obligation target

71. Chart 4 provides a high-level summary of the modelling process. More detail on the approach and key assumptions can be found in Annexes C and B respectively.

Chart 4: Flow Diagram for the Affordable Warmth Model



[65] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent
[66] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

6.1 Appraisal Period

72. The policy is appraised over the period 2018 to 2064, an appraisal period of 46 years. This reflects the lifetime of the energy efficiency measures that are expected to be installed during ECO3, the longest-lived of which (cavity wall and loft insulation) are estimated to last for 42 years[67]. This approach of ensuring that the benefits are captured over the full lifetime of the measures is in line with Green Book Guidance[68].

73. In reality, we might expect some households to maintain the energy efficiency measures installed to ensure that the measures do not expire. However, as this is a voluntary decision by households, neither the costs nor benefits of doing so are captured within this IA.

6.2 Improvements to the Evidence Base

74. The key improvements to the evidence base are outlined in Table 1, below. More detail can be found in Annex B.

Table 1: Key improvements to the evidence base since the consultation

Area of change	Description and Type of Change	Reason for Change
Search (or lead generation) costs	The costs of finding households that are eligible for the scheme. Search costs have largely been **increased**[69].	Consultee feedback Evidence gathered through the supply chain survey (see Annex B)
Gas boiler and first-time central heating installation costs	The capex costs of installing gas boiler and first-time central heating systems These costs have been **decreased.**	Consultee feedback (both installers and some obligated energy suppliers reported our costs were too high)
Contribution rates to solid wall insulation and gas boilers	The assumed level of co-funding for solid wall insulation and gas boilers coming from households, local authorities and the Scottish and Welsh Governments (which reduces the costs to suppliers of delivering these measures)	Consultee feedback The market price for solid wall insulation (which is considerably lower under ECO2t than the cost presented in the consultation stage IA)[70] Supply chain survey

[67] Given measures deployed until March 2022, the appraisal period would need to run to 2064 (42 years after the last year of ECO3) 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.
[68] A shorter appraisal than to 2064 would exclude some of the benefits associated with these long-lived measures from the impact analysis. As the costs are generally incurred earlier in the appraisal period than benefits, this would also lead to be unequal treatment of costs and benefits (that is, skewing the analysis towards the costs), reducing the potential estimated benefits of the policy. Similarly, as no costs or benefits are realised after 2064 (as all of the measures installed are assumed to have expired) there is no justification for a longer appraisal period. It is possible that the additionality of some of the measures may tail off over this appraisal period. However, with the exception of boilers, whose lifetime has been adjusted to capture the reduced additionality of these measures compared to a boiler's natural (or technical) lifetime (see Annex D) we have no evidence to reduce other measure lifetimes, so have maintained additionality for the full measure lifetime, in line with past ECO IAs.
[69] While it was possible to update the search cost assumptions for this IA, we do not have sufficient evidence to ascertain how search costs may vary with the size of the eligible pool. BEIS assumes that the search costs generally increase as you narrow the pool size, as was seen, for example, when you compare the search costs under the Carbon Emissions Reduction Target's narrowly-focused Super Priority Group with those under the broader-focused Non Priority Group (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/350722/CERT_CESP_Evaluation_FINAL_Report.pdf). While BEIS expects search costs to be higher as the pool size shrinks, the evidence from the CERT Evaluation is not sufficient to inform the exact relationship between the pool size and search costs, as household and measure eligibility was quite different to that under the ECO3 scheme.
[70] Costs of delivering solid wall insulation under ECO2t can be found in the Household Energy Efficiency National Statistics https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

Area of change	Description and Type of Change	Reason for Change
	The contribution rates have been **increased**	
Findability	The assumed number of eligible (and untreated) properties that can be found each year. Findability rates have been **increased** for both loft and cavity wall insulation. They remain unchanged for other measures	The modelled market prices using the findability rates used in the consultation stage IA are considerably higher than those observed in the market under ECO2t. While we would expect the price to rise with a greater level of delivery under ECO3, and the removal of the 30% uplift (see Section 5), the findability rates were deemed to be creating very steep supply curves, leading to unrealistically high levels of rent and modelled market prices. Consequently, the findability rates were increased. Further information on the assumed trajectory for modelled market prices can be found in Annex B.
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

75. Consultees did not raise concerns about some of the Department's other key assumptions (such as the assumed level of hidden costs[71], nor the insulation cost assumptions (which were reviewed and updated during the ECO2t consultation).

[71] 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. See Annex B for more information.

7. Counterfactual

76. This section discusses uptake in the absence of Government intervention. This update is netted off the costs and benefits of the final Government policy design.

77. Uptake expected in the absence of Government intervention (that is, business as usual uptake), and uptake from complementary policies (that is, the Private Rented Sector Regulations) are discussed, in turn, below.

7.1 Uptake in the Absence of Government Intervention

78. Published reports have outlined that Government schemes are the principal driver the update of energy efficiency measures, and that uptake of insulation measures would be expected to be limited in the absence of Government invention[72]. This is due to the market failures and barriers outlined in Section 2 above.

79. Households targeted under ECO3 have low income and tend to suffer from a lack of access to credit, meaning these households, in particular, would not generally be expected to install most measures in the absence of Government intervention[73].

80. Previous analysis undertaken by BEIS using the English Housing Survey[74], however, has shown that in private tenure fuel poor households, gas boilers are replaced on average every 15 years, compared to an average gas boiler lifetime of 12 years[75]. Current Affordable Warmth scoring rules mean that boilers are typically only replaced under the scheme if they are broken or not operating efficiently, and cannot be economically repaired. As a result, it is assumed that when replacement boilers are installed under ECO, they are replacing broken systems which in the absence of the policy would have been naturally replaced after 3 years. This means that replacement boilers under ECO will have between 0 and 3 years of 'additionality' compared to the counterfactual.

7.2 Uptake under other Government schemes

81. The Private Rented Sector (PRS) Regulations came into force on 1 April 2018, and require privately rented properties in England and Wales, which are legally required to have an EPC when they are let out, to have an energy efficiency rating of at least E before the landlord can enter into a new tenancy. This requirement is subject to a limited number of exemptions, including an exemption for domestic properties where the landlord is unable to access third party funding (such as the Green Deal or ECO) to cover the full cost of improvements.

82. The ECO3 consultation stage IA estimated that around 8,000 PRS households below band E would be treated under ECO, which would potentially also be treated under the PRS Regulations. Including this uptake in both the ECO3 IA and that for the PRS Regulations would lead to a double counting of benefits across the two (i.e. BEIS could over estimate the number of households that the two policies combined could treat, if it fails to account for the overlaps between the policies). The consultation stage ECO3 IA therefore outlined that these 8,000 PRS

[72] See, for example, the OFT call for evidence on insulation http://webarchive.nationalarchives.gov.uk/20140402142426/http:/www.oft.gov.uk/shared_oft/markets-work/energy-efficiency/oft1433.pdf

[73] Churn in the housing market may mean that the fuel poor homes targeted by suppliers might eventually be occupied by non fuel poor occupants with the financial resources to make energy efficiency improvements. However, as outlined in the previous paragraph, there is little evidence that households in general would be willing to make energy efficiency improvements in the absence of Government intervention.

[74] https://www.gov.uk/government/collections/english-housing-survey

[75] In contrast, the analysis suggests that social tenure households replace their gas boilers on average every 12 years (i.e. at the point when the boiler breaks on average), and private tenure non-fuel poor households replace on average every 10 years (before the boiler breaks completely).

households would be included in the ECO IA but excluded from the next IA for the PRS Regulations.

83. Government, however, recently consulted[76] on amending the domestic PRS property provisions to remove the current 'no cost to the landlord' exemption and introduce a capped landlord spending requirement which could take effect instead of, or alongside, third-party funding such as ECO. The PRS consultation proposed that the capped landlord spending requirement should be inclusive of available ECO funding; a range of views were received in response to this proposal, with a majority arguing that ECO funding should not be included within any capped landlord spend.

84. In response to this, the Government has decided to restrict ECO measures allowed to PRS properties with an EPC rating below an E to solid wall insulation and high cost heating measures – i.e. more expensive measures that are likely to fall above the cap (the consultation proposed a cost-cap of £2,500, although a range of cap options were explored). Further, as the ECO scheme operates across Great Britain, the Government has decided that the restrictions will apply across all GB regions[77].

85. As a result, the overlap with the PRS policy has largely been removed, as the volume of F and G rated PRS properties is small relative to the stock as a whole, and the assumption that suppliers will find it more cost effective to install cheaper measures (such as loft top up) to these homes rather than more expensive measures such as SWI[78].

[76] https://www.gov.uk/government/consultations/domestic-private-rented-sector-minimum-level-of-energy-efficiency

[77] Scotland intends to introduce its own minimum energy efficiency standards for privately rented properties shortly.

[78] There are two reasons to believe the volume of solid wall insulation going to PRS social F and G are likely to be relatively small. Firstly, PRS F and G rated properties only comprise around 1% of the housing stock. Its small size would therefore imply, all else equal, that few of these properties are likely to be treated to meet the solid wall homes minimum. Secondly, feedback from stakeholders and delivery statistics suggest that suppliers tend to target social housing to meet their solid wall minimums. For example, based on data underpinning the Household Energy Efficiency National Statistics, over 50% of SWI has been installed has been in social housing, around a third was installed in owner occupied housing and the remainder (around a sixth) was installed in the private rented sector in the first 12 months of ECO2t. This low update may reflect the difficulty in gaining consent from multiple landlords for jobs involving multiple properties. The consultation stage IA outlined that virtually no solid wall insulation was expected to be installed in PRS F and G properties (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/696443/ECO_3_Consultation_Stage_IA.pdf, Figure 1, page 11)

8. Categories of Costs and Benefits

8.1 Summary of key costs and benefits

86. Table 2, 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 D, while more details on the justice impact, and potential impacts of Flexible Eligibility and Innovation can be found in Annexes N, I and J respectively.

Table 2: Summary of Key Costs and Benefits

Group	Costs	Benefits
Costs and Benefits included in the Cost – Benefit Analysis (monetised)	Energy efficiency and heating measure installation costs	Societal energy savings
	Hidden costs associated with installing measures	Carbon savings
	Ongoing operational costs of heating measures	Air quality improvements
	Supplier administration costs	Comfort taking (the benefit of warmer home)[79]
	Search costs	
	Natural boiler replacement cost savings (negative costs)[80]	
	Costs to the administrator	
	Opportunity Costs of household finance	
Monetised benefits not included in the Cost – Benefit Analysis		Health impacts
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, vulnerable and fuel poor households
	Consumer bill impacts	
	Household contributions	
Non-modelled/ non-monetised impacts	Justice Impact (no significant impact on the justice system expected)	Flexible Eligibility[81]
		Increase in innovation for energy efficiency fabric and installation techniques
		Improvement in security of energy supply
		Wider economic benefits, for example supporting the energy efficiency supply chain, creating green jobs
		Community impacts
		Reduction in energy system costs

[79] Comfort taking is estimated to be 15 per cent of the energy savings from the installed measure. See: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43000/3603-green-deal-eco-ia.pdf p.132 for more details.

[80] See Annex B for more information

[81] More granular targeting of vulnerable homes in need of assistance even if they don't fall into the strict definitions for eligibility for fuel poverty. See Annex I for more information on Flexible Eligibility.

8.2 Excess subsidies ('Economic Rent')

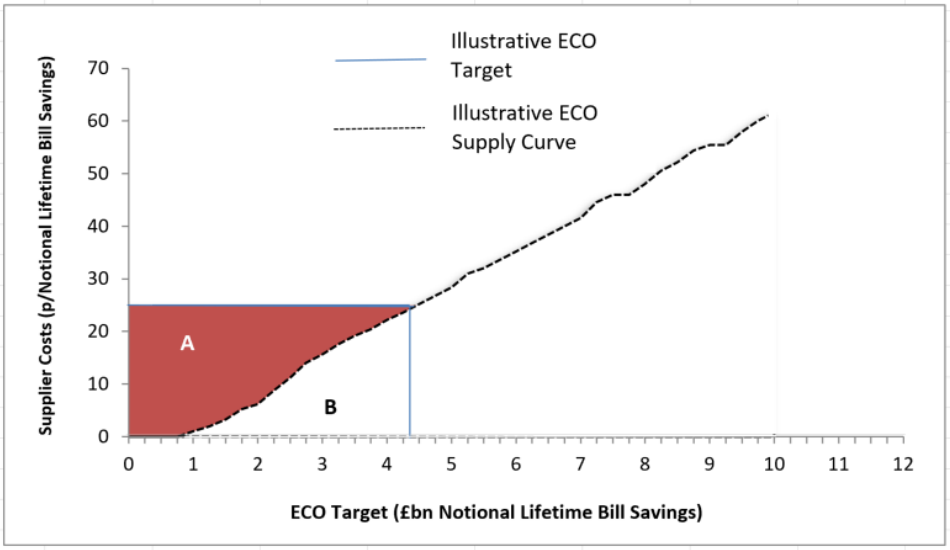
87. For the purposes of this IA it is assumed that suppliers cannot price discriminate between different households, in that they cannot infer the minimum subsidy level needed to induce each household to install energy efficiency measures. This means they are assumed to pay the same subsidy to all households to meet their obligation, implying that some households or installers are paid a subsidy larger than they would have needed to induce them to take up the measure. This excess subsidy is referred to as 'economic rent'.

88. The concept of economic rent is illustrated in Figure 2 below. The blue vertical line shows the demand (from suppliers) for bill savings to meet their obligation. The upward sloping dotted black line, meanwhile, shows the supply of 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 bill savings targets, suppliers can promote and install the most cost effective measures, and can target the most amenable households.

89. As the level of the target increases, however, suppliers must move up the supply curve, and consequently pay larger subsidies to less amenable households or install higher cost measures; these act to increase the market clearing subsidy that suppliers must pay in order to meet their obligation.

90. If suppliers could infer each households' willingness to pay, the cost of the scheme would be the area under the supply curve (area B below). However, because they are unable to make this distinction, they also must pay excess subsidies to some households (the area labelled A). The area A represents an additional cost to suppliers of meeting their obligation[82].

Figure 2: Illustrative ECO Supply Curve



91. In line with past RPC validated ECO IAs, we assume that the economic rent accrues to householders rather than the supply chain or the energy suppliers themselves[83,84]. As such, the estimated cost to business is higher than if businesses accrue some of the rent.

[82] We have received informal feedback that offers are not usually tailored to the individual household, leading to excess subsidies in some cases. This supports the incorporation of economic rent into the supplier costs when determining what they can deliver within the £640m per year spend envelope.
[83] 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.
[84] Although the actual distribution of the economic rent is uncertain. The supply chain could capture some of the economic rent if they achieve excess profits when selling lifetime bill savings to energy suppliers, or the energy suppliers themselves (if they pass on higher costs onto their consumers than they incur from delivering ECO).

92. The Affordable Warmth model accounts for the economic rent that accrues to households when calculating the volume of measures and targets suppliers are expected to be able to achieve within the £640m per annum spend envelope. In other words, when determining what target suppliers can achieve at a spend level of £640m per year, the Affordable Warmth model will use the combined costs of areas A and B – rather than just B.

9. Impact Analysis

9.1 Costs and Benefits

93. The overall monetised costs and benefits of the policy options to society, net of the counterfactual and discounted to 2017, are shown in Table 3.

Table 3: Aggregate Costs and Benefits of ECO3, 2018 – 2064 (£m, 2017 prices)

Description of costs and benefits	Present Value Final Government Position
Installation costs	1,192
Value of Economic Rent (assumed to be paid by suppliers)	*772*
Hidden costs	140
Supplier administration costs	175
Boiler warranties	15
Search costs	257
Operational costs	33
Natural boiler replacement costs[85]	*-202*
Finance costs[86]	10
Costs to the administrator	5
Total Costs (excluding rent)	**1,624**
Value of energy saved	1,272
Value of air quality improvements	99
Value of change in traded carbon savings	44
Value of change in non-traded carbon savings	622
Value of comfort taking	305
Benefit of economic rent to consumers	*772*
Total Benefits (excluding rent)	**2,342**
Overall Net Present Value	***718***

94. The installation costs of the energy efficiency measures, which do not include any 'excess subsidy' or economic rent (as it is a transfer)[87], represent the largest societal cost from ECO3 under the final option at £1,192m. This is slightly larger than the figure presented in the consultation stage IA under the preferred option of £1,011m, and largely reflects that more measures are assumed to be installed within the £640m per year spend envelope[88].

95. Search costs represent the second largest component of the costs, at £257m, which is larger than the £127m presented under the preferred option in the consultation stage IA, and reflects BEIS' decision to revise up its search cost assumptions, based on evidence received through the supply chain survey (see Annex B). Fixed admin (supplier administration costs), meanwhile, are £175m. This is slightly lower than the consultation stage IA, and reflects the Department's

[85] 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).
[86] BEIS has included finance costs (the opportunity cost of household finances), consistent with past RPC validated IAs. More information on the justification for including the finance costs can be found in Annex B.
[87] The economic rent or excess subsidy' is recorded in the CBA table as a cost to suppliers but a benefit to consumers. These cost and benefits cancel out and therefore do not affect the overall net present value of the policy.
[88] This reflects the changes in the assumptions outlined in Section 6.2 – in particular the higher levels of assumed third party contributions.

decision to revise down the assumed supplier administration costs over ECO3 (see Section 9.2 below).

96. There are large negative costs, meanwhile, because of natural boiler replacement costs. These are much smaller than the costs presented in the consultation stage IA (-£412m), and reflect the downward revision to the costs of boilers.

97. The largest component of the benefits is the societal energy savings, at £1,272m, which are higher than the £1,007m presented under the preferred option within the consultation stage IA. As with the installation costs, this reflects that more measures are assumed to be installed within the £640m per year supplier spend envelope. After the energy savings, the largest benefits are non-traded carbon savings at £622m (compared to £357m in the consultation stage IA)[89], comfort taking at £305m (£280m) and air quality improvements at £99m (£125m).

98. Table 4 shows the same costs and benefits as in Table 3, but after applying equity weights to the appropriate components. This reflects the distributional impacts of the scheme, consistent with the Green Book guidance[90] (Annex B for more information).

Table 4: Equity-Weighted Costs and Benefits, 2018 - 2064 (2017 prices)

Description of costs and benefits	Present Value, £m Final Government Position
Installation costs	1,175
Value of Economic Rent (assumed to be paid by suppliers)[91]	*1,103*
Hidden costs	140
Administration costs	250
Boiler warranties	21
Search costs	367
Operational costs	59
Natural boiler replacement costs	*-444*
Finance Costs	22
Costs to the administrator	5
Total Costs	**2,230**
Value of energy saved	1,272
Value of air quality improvements	99
Value of change in traded carbon savings	44
Value of change in non-traded carbon savings	622
Value of comfort taking	738
Extra utility from lower bills in low income households	*2,999*

[89] The large increase in the non-traded carbon savings reflect that more measures are estimated to be installed within the £640m per year supplier envelope – this, in turn, reflects the changes in the assumptions outlined in Section 6.2. These measures tend to go to gas heated homes (which is the main heating fuel of around 85% of homes in England (https://www.gov.uk/government/statistics/fuel-poverty-additional-tables-2018 - see table A3), leading to a large increase in the gas savings.

[90] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[91] As outlined in Section 11.1, in line with past impact assessments, we assume that economic rent accrues to the household or the supply chain, and not energy suppliers. The equity-weighted value of the economic rent paid for by suppliers (and ultimately bill payers because of the pass through onto their energy bills) under the costs will be lower than the equity weighted economic rent accruing to low income households receiving ECO measures (under the benefits), as the latter are estimated to have lower incomes than the former.

Description of costs and benefits	Present Value, £m Final Government Position
Value of economic rent to low income households	*1,789*
Total Benefits	**7,563**
Equity-weighted Net Present Value	***4,334***
Proportional change in net present value from equity weighting	*504%*

99. The equity weighting tends to increase both the costs and benefits of the policy outlined in Table 3, but with a more significant increase in benefits. This is because most 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.

100. Unlike the net present values shown in Table 3, the equity weighted value of rent is higher for low income households in receipt of ECO measures than the rent paid for by suppliers (and subsequently consumers through their energy bills).

101. The increase in the Net Present Value (NPV) is larger than those presented in the consultation stage IA (the equity weighted NPV was around £2.8bn under the preferred option of the consultation stage IA, compared to £4.3bn shown above), and reflects the new equity weights presented in the latest Green Book, which place a greater weighting on low income households. See Annex B for more information.

9.2 Annual Costs to Suppliers

102. 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 3. As announced in the 2015 spending review, ECO has a spend envelope of £640 million per year, rising with inflation, until March 2022[92]. Suppliers are, in turn, assumed to recoup the costs they incur in meeting their obligation from their customers.

103. Table 5, below, shows suppliers' costs broken down by obligation during ECO3, and how these compare to the annual supplier costs expected to be incurred under ECO2t, running from April 2017 to September 2018.

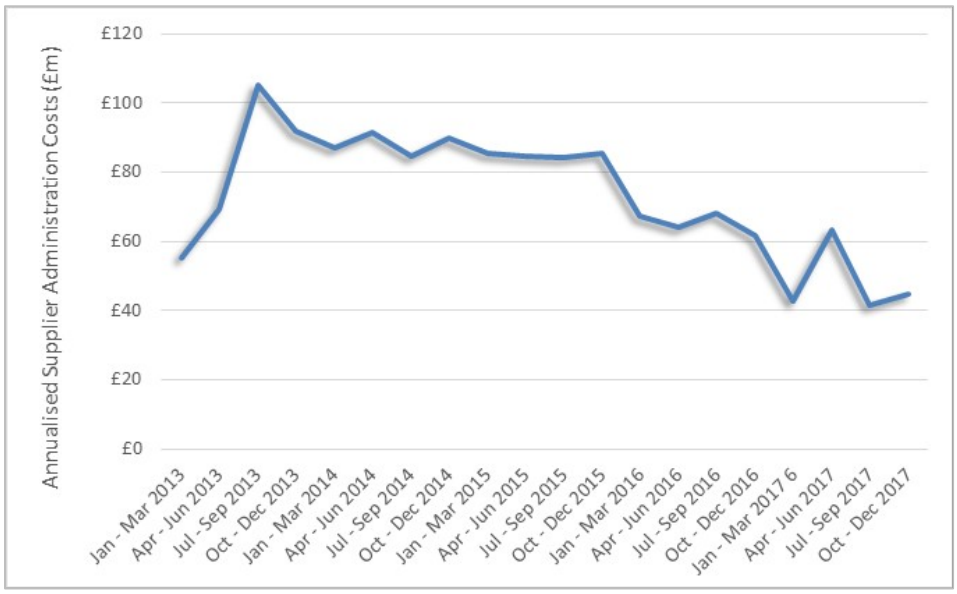
Table 5: Supplier Costs During the ECO2t and ECO3 (Real 2017 Prices, Undiscounted)

Cost Component	Cost (£m) per annum under ECO3	*Costs (£m) per annum under ECO2t – IA*
CERO Delivery Costs	£0m	£165m
AW Delivery Costs	£585m	£390m
Administration	£55m	£85m
Total Costs	**£640m**	**£640m**

104. The table above shows BEIS is assuming lower administration costs for suppliers during ECO3. This reflects the fall in supplier administration costs in recent years, from the equivalent of around £85m per year to as little as £40m per year, as illustrated in Figure 3 below.

[92] The £640m per year figure quoted above is in 2017 prices.

Figure 3: Reported Supplier Administration Costs in Delivering ECO (Annualised)[93]



105. Following discussions with obligated energy suppliers, the main drivers of the decline in administration costs are:
    - the smaller size of the ECO (reducing the overall administration needed);
    - the administrative simplifications introduced under the ECO2t (see Annex A of the ECO2t final stage IA for more information)[94];
    - the closure of suppliers' delivery arms; and
    - efficiency savings made by obligated energy suppliers in delivering ECO[95].

106. Most of these factors are expected to persist into ECO3, so BEIS has reduced the assumed administration costs as a result.

107. The assumed annual administration costs of £55m, while lower than observed in the first few years of ECO, are slightly higher than the administration costs being observed in the market towards the end of 2017. This conservative view reflects that administration costs may increase as market activity picks up during ECO3, and as the ECO thresholds are lowered over the course of the scheme.

9.3 Measure Uptake

108. Table 6, below, shows modelled gross measure uptake during ECO3. The most frequently installed measures are low cost cavity wall insulation and loft insulation. The broken heating systems replacement limit of 35,000 per year is estimated to be broadly reached, and around 60-70,000 solid walls are insulated as a result of the solid wall homes minimum. In all, around 1.2m measures are estimated to be installed under ECO3, up from around 1m in the consultation stage IA, due to the reduced costs of boilers and first-time central heating systems, higher contributions to boilers and sold wall insulation, and the increased findability rate assumed for loft and cavity insulation (see Section 9.1 and Annex B for more information)[96].

[93] Source: Household Energy Efficiency National Statistics (see https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-january-2018 Table 2.8)

[94] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586266/ECO_Transition_Final_Stage_IA__For_Publication_.pdf

[95] A larger share of the obligation being delivered by non-Big Six suppliers may also be partly driving this result (as they have lower admin costs per measure installed than the Big Six), although this appears to be a relatively small driver of the trend compared to the points raised above.

[96] How suppliers choose to meet their ECO targets is a commercial decision for individual energy suppliers. Thus, the actual volume of each measure type may vary from those shown in the table below.

Table 6: Modelled Uptake of Energy Efficiency Measures Between October 2018 – March 2022

	Final Government Position
Low Cost Cavity Wall Insulation	526,000
High Cost Cavity Wall Insulation	9,000
Loft insulation (including room in roof)	490,000
Solid wall insulation - external	68,000
Broken heating systems replacements	115,000
First time central heating	11,000
Storage heaters	0
Heat Pumps	0
Heating controls	15,000
Total measures	1,240,000

9.4 Homes Treated

109. The number of homes treated under ECO3 under the final policy position is shown in Table 7, below, and shows that around 1.2m homes are expected to be treated under ECO3. This is an increase from approximately 900,000 presented under the preferred policy option in the consultation stage IA, and reflects the updated assumptions (outlined above), which mean that more homes can be treated within the £640m pa spend envelope.

110. The percentage of fuel poor households in England receiving a measure is 29%, broadly the same as the 30% presented under the preferred option in the consultation stage IA (note the total number of households receiving a measure in the table below is for GB, so only a subset will be in England). However, the volume of fuel poor homes has increased from 244,000 under the preferred option in the consultation stage IA to 295,000.

Table 7: Estimated Number of Homes Treated and Insulated under ECO3

Number of Homes Insulated / Treated	Final Government Position
Homes Insulated (GB)	1,174,000
Number of Homes Treated (GB)	1,195,000
Number of Fuel Poor Homes Receiving a Measure (England Only)	295,000

9.5 Carbon Savings

111. Table 8 shows the traded and non-traded carbon savings[97] under the Government's scheme design[98]. Savings are larger in the non-traded sector, reflecting that most homes treated are heated by non-traded fuels (gas, solid fuels or oil). 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[99].

[97] 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).
[98] An updated assessment of the impact of policies on carbon emissions will be published in the 2018 Energy and Emissions Projections (EEPs). The EEPs 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.
[99] The removal of the Carbon Emissions Reduction Obligation will lower the volume of carbon savings that are achieved by ECO. More detail is provided in footnote 30

Table 8: Estimated Greenhouse Gas Savings over Carbon Budget (CB) 5 and the lifetime of the policy (MtCO2e)

	CB5 (2028 – 2032)	Total
Traded	0.21	1.75
Non-Traded	1.11	9.33
Total	1.32	11.08

9.6 Impact on Energy Bills

112. The costs incurred by energy suppliers in meeting their obligations are expected to be passed onto domestic customers through their gas and electricity prices. This means that suppliers have an incentive to deliver their obligation cost effectively, and thus reduce the costs they pass onto their customers.

113. 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 2019. However, for those households treated under ECO, the policy could deliver a net saving on their annual dual fuel bill of up to £300 (for measures such Solid Wall Insulation)[100].

114. When ECO3 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 because of the scheme, while the bill savings from measures installed under ECO3 will continue to be realised until the measures expire – often several decades after the scheme has ended.

9.7 Progress Against the Fuel Poverty Milestones

115. Table 9 shows progress towards the fuel poverty target and milestones, alongside the latest year covered by the fuel poverty statistics for England (2018)[101], to demonstrate the cumulative progress since the start of the ECO until the end of ECO3. The table does not include the progress that results from other policies such as the Private Rented Sector Regulations (which were discussed in Section 7).

116. The table shows that by the end of ECO3, the proportion of fuel poor homes at EPC Band E or above is estimated to be around 92% - up slightly from 91% in 2018. Larger increases are apparent for the other two milestones, however, with the percentage of fuel poor households at least EPC Band D and C increasing by 9 percentage points and 10 percentage points respectively.

Table 9: Estimated Progress Against Fuel Poverty Milestones (England Only), 2021

Fuel Poverty Milestones	ECO3 Final Stage IA	Fuel Poverty Projections 2018
Percentage of Fuel Poor Households in Dwellings Rated EPC Band C+ (2030 Statutory Target)	18%	8%
Percentage of Fuel Poor Households in Dwellings Rated EPC Band D+ (2025 interim milestone)	72%	63%
Percentage of Fuel Poor Households in Dwellings rated EPC Band E+ (2020 interim milestone)	92%	91%

[100] https://www.gov.uk/government/publications/estimated-impacts-of-energy-and-climate-change-policies-on-energy-prices-and-bills-2014
[101] https://www.gov.uk/government/statistics/annual-fuel-poverty-statistics-report-2018

9.8 Health benefits

117. 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.

118. BEIS has monetised the health benefits associated with making these energy efficiency improvements under ECO3 using BEIS's Health Impacts of Domestic Energy Efficiency Measures (HIDEEM) model (more details on this model can be found in Annex L). HIDEEM simulates the change in relative risk of a range of cold-related morbidity and mortality risks for people living in homes receiving energy efficiency improvements. The changes in relative risk are then converted into Quality Adjusted Life Years (QALYs) and monetised in accordance with Department of Health guidance on health valuation[102].

119. 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 currently include the monetised health impacts in the cost-benefit analysis. BEIS is also 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 be potentially significant.

120. Table 10 presents the estimated impacts over ECO3. Overall, the monetised health benefits are expected to be £177m, with installation of cavity and loft insulation making up most of these benefits.

Table 10: Health Benefits by Measure

Measure	Health benefits (£m)
Cavity Wall Insulation	£117
Loft Insulation	£50
Solid Wall Insulation	£9
Central Heating	£0.2
Boiler Replacement	£1
Total Health Benefits	£177

[102] See: https://www.gov.uk/government/publications/green-book-supplementary-guidance-health

10. Sensitivities

121. A full list of sensitivities included in this impact assessment is shown in Table 11. Each assumption 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 on the other sensitivity assumptions can be found in Annex C.

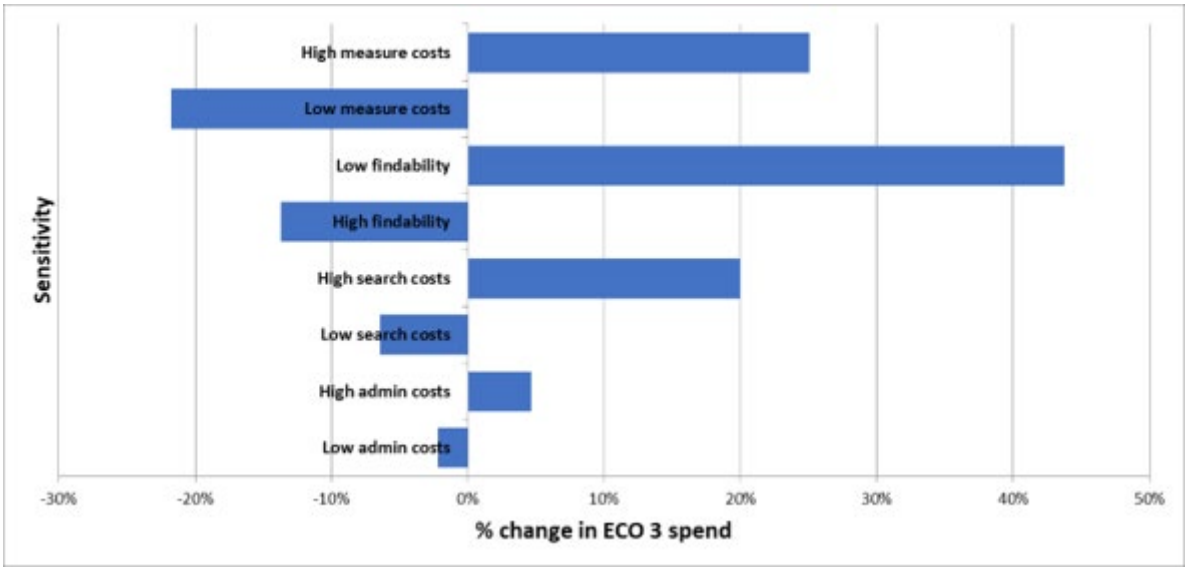
Table 11: Details on the Assumed Sensitivities

Sensitivity Category	Sensitivity detail	Low	Central	High
Household Findability (AW)[103] – percentage of the remaining technical potential that suppliers can identify each year	Cavity Wall Insulation	8%	12%	16%
	Loft Insulation	12%	16%	20%
Measure Costs	Solid Wall Insulation	10% lower		18% Higher
	Loft Insulation	51% Lower		146% Higher
	Cavity Wall Insulation	18% Lower		23% Higher
	Replacement Boilers	30% Lower		50% Higher
	First Time Central Heating	30% Lower		25% Higher
Search Costs	Boiler Replacement – on gas grid	£90	£130	£180
	Boiler Replacements – off the gas grid	£130	£620	£1,000
	Other Measures – on gas grid	£130	£210	£520
	Other Measures – off gas grid	£300	£400	£500
Administration		£41m	£55m	£85m

[103] For the purposes of this IA, we assume that suppliers cannot identify all of the technical potential, so this flexibility tests the impact of varying the 'findability' of eligible households.

10.1 Supplier Spend Sensitivities

Chart 1: Sensitivity of ECO3 Spend to Changes in Assumptions



122. Chart 1 shows that increasing measure costs leads to a roughly 25% increase in supplier spend, while decreasing them reduces supplier spend by just over 20%. Increases in supplier spend reflect the assumed change in measure costs (with a greater increase in the measure costs assumed under the high scenario), although this is somewhat offset by a change in the measure mix – that is, suppliers are assumed to change the measure mix they install in order to meet their obligation (moving away from now comparatively high cost measures towards lower cost measures).

Household Findability

123. Varying the findability rate for eligible households has an asymmetric impact on suppliers' costs. Increasing the findability reduces the supplier spend by less (just over 10%) than when findability is decreased (spend is over 40% higher). This is because suppliers find it more difficult to find cheaper measures (such as loft insulation and low-cost cavity wall insulation), and therefore must install more expensive measures in order to meet their targets.

Other Sensitivities

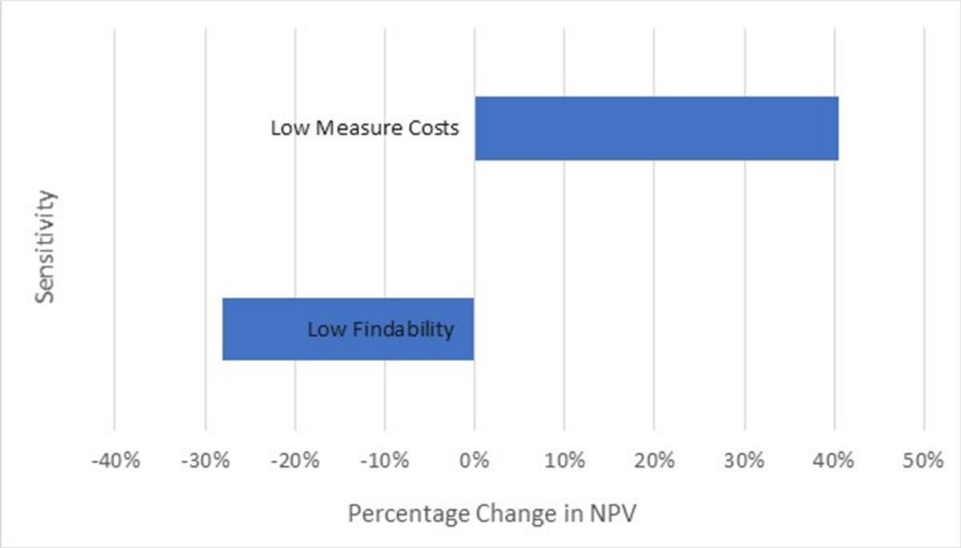
124. Chart 1 also shows the impact of varying the search costs suppliers incur in finding ECO eligible households, and supplier administration costs. Increasing the assumed search costs increases supplier spend by around 20% while reducing them leads to a smaller than 10% reduction in spend. Administration costs, meanwhile, show a lower variance (generally less than 10% variance in supplier spend).

10.2 Net Present Value (NPV) Sensitivities

125. Chart 2 below shows how the NPVs changes with changes in the input assumptions. Only the assumptions that have the largest impact on the NPVs are presented[104], as varying some of the input assumption (such as the changes in the supplier administrative costs) are expected to have a very marginal impact on the overall policy NPV. As low measure findability leads to the largest decrease in NPV, and low measure costs the largest increase, these sensitivities illustrate the most positive and negative view of the ECO3 NPV.

[104] The choice of NPV sensitivities was informed, in part, by the spend sensitivities, which showed that low findability led to the largest increase in estimated supplier spend, while the low measure led to the greatest reduction.

Chart 2: Sensitivity of Affordable Warmth Spend to Changes in Assumptions



126. Chart 2 above shows that assuming the low findability rate lowers the NPV of the policy by around 30% (or about £200m). The reduction in the NPV is primarily driven by higher capital costs (as suppliers cannot find as much of the remaining cost-effective technical potential as assumed under the central scenario, so need to install less cost-effective measures in order to meet their targets), and higher opex costs (as suppliers promote and install more heating measures – first-time central heating, and ground source heat pumps).

127. Even with this more pessimistic assumption of the findability, the policy is still of net benefit to society, with an overall NPV of around £500m (compared to around £700m under the central scenario).

128. Meanwhile, assuming the low measure costs increases the NPV of the policy by around 40% (or around £300m). Most of the savings are driven by reduced capital costs for the measures installed, and leads to a small fall in the lofts and cavities being insulated (and greater uptake of room in roof and first-time central heating systems). The benefits remain largely the same as under the central scenario.

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

11.1 Businesses and Range of Impacts Considered in the Equivalent Annualised Net Direct Cost to Business (EANDCB)

129. Businesses that face a direct regulatory impact because of ECO3 are larger domestic energy suppliers. For the first six months of ECO3, suppliers with more than 250,000 customer accounts and that supply more than 500GWh of electricity or 1,400GWh of gas to domestic customers a year[105] will be obligated. This will be reduced to 200,000 customer accounts from April 2019 (and supplying more than 400GWh of electricity and 1,100GWh of gas per year) and 150,000 customer accounts from April 2020 (more than 300GWh of electricity and 700GWh of gas per year). The share of the overall obligation increases with the size of the supplier.

130. The supply chain will also be affected by the obligation, as energy suppliers will contract with third parties to deliver installation and heating measures to allow them to meet their ECO targets[106]. However, in line with the Better Regulation Executive guidance, these changes are indirect and so its impacts are not captured in the EANDCB.

Direct Costs and Benefits

Direct Costs

131. The costs suppliers incur are expected to be passed on from suppliers to customers through energy bills, so these costs are treated as direct for EANDCB purposes, consistent with their treatment in past ECO IAs[107].

132. 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, totalling £640m per year (see Section 9); both cost components are outlined in more detail in Annex D.

133. Section 8.2 outlines that the market clearing subsidy is assumed to be the last (or marginal) household installing a measure. As suppliers are assumed to be unable to distinguish between households, they must pay this (same) subsidy level across all households; therefore, some householders are assumed to accrue economic rent. This increases the cost to suppliers of meeting their obligation.

134. Consistent with past ECO IAs, it has been assumed (in the absence of evidence to the contrary) that households capture all the economic rent[108]. As a result, economic rent is incorporated into the £640m per annum spend[109], and consequently the EANDCB, business NPV and Business Impact Target. The Government's approach represents the most conservative projection of direct costs to suppliers.

Direct Benefits

135. 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.

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[105] This has been altered from the volumes under ECO2t, which were set at 2000GWh of gas or 400GWh of electricity per year, following feedback from suppliers that the volumes were out of line with the current gas and electricity supplied per customer. The new thresholds are based on BEIS analysis of Ofgem data for the year ending 2017.

[106] See also the discussion on the impact on installers at the start of the small and micro business assessment (Section 11.2).

[107] See, for example, the 2012 ECO IA, which 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

[108] In practice it is possible that suppliers (and installers) may also capture some of the rent

[109] As described in Section 8.2, this means we include the economic rent when calculating the targets that suppliers can deliver for £640m per year.

EANDCB Position and Business Impact Target Status

136. The EANDCB for ECO3 is estimated to be £554m, based on a four-year appraisal period. This is shorter than the one appraising the costs and benefits discussed in Section 9.1, as the costs faced by suppliers are incurred in the first 4 years of the scheme, whereas the benefits (mainly to households) accrue over a longer timeframe. This means a longer appraisal period would be appropriate when considering the full costs and benefits to society (46 years), but a shorter one (4 years) when estimating the costs to business. This approach is consistent with the approach taken in previous RPC-validated ECO IAs[110]

137. The Business Impact Target presented in the ECO2t final stage IA was -£3,041m[111]. This was because the 1.5-year ECO Transition – the regulatory OUT – was measured against a counterfactual of the larger ECO2 regulations (worth around £840m per year in 2017 prices) being extended for 5 more years (i.e. the duration of the extension that was outlined in the 2015 Spending Review[112]) – the regulatory IN.

138. As a result, this final stage IA only counts the IN from the 3.5-year extension to ECO (i.e. ECO3 without a counterfactual), as the 5-year counterfactual has already been accounted for in the ECO2t final stage IA.

139. The Business Impact Target is shown below. The result is an increase in regulatory costs of £1,940m over the course of ECO3.

140. The business net present value, meanwhile, is -£2,072m. This is based on the £640m per year supplier costs (for 3 years) and one year of £320m spend[113], and includes the economic rent that suppliers must pay households when they install energy efficiency measures (as outlined above, and in Section 8.2).

Table 12: Equivalent Annualised Net Direct Cost to Business (2014 prices)
Business Impact Target scoring

EANDCB ECO3 (£640m supplier spend for 3.5 years)	Business Impact Target
+£554m	+£1,940m

11.2 Small and Micro Business Assessment[114]

141. Businesses that are directly affected by ECO3 are medium and large energy suppliers. Some small and micro businesses in the supply chain may also be indirectly affected by the increased level of supplier demand for their services because of the ECO extension to March 2022. This is expected to have a positive impact on these companies' gross profits compared to a counterfactual of not continuing the scheme[115]. However, on the grounds of proportionality, BEIS has not attempted to calculate the impact on gross or net profits as a result of ECO3.

Background

142. Suppliers are only obligated under ECO once they reach a certain size – this is known as the minimum threshold. When ECO began in 2013, the threshold was set at 250,000 customer

[110] See for example, the final stage IA for the ECO Transition: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586266/ECO_Transition_Final_Stage_IA__For_Publication_.pdf
[111] Ibid
[112] https://www.gov.uk/government/topical-events/autumn-statement-and-spending-review-2015
[113] If suppliers incur costs of £640m per year, one would expect them to incur half that over 6 months (as ECO is a 3.5-year scheme).
[114] Please note that the analysis in this IA does not take into account the energy bill cap.
[115] This occurs because a higher demand for energy efficiency measures under ECO will push up the market price. This may cause the installer to take on more work and/ or may increase the margins they receive on their existing work.

accounts (and supplying over 400 GWh of electricity or 2000GWh of gas per year). At the time, the Big Six[116] dominated the energy market, with a combined market share of 99%[117], meaning they were the only suppliers obligated[118].

143. However, since January 2013, the number and size of energy suppliers outside of the Big Six has grown. At the end of 2017 there were around 70 energy suppliers, of which 15 (including the Big Six) exceed 250,000 customer accounts and are therefore obligated under ECO. Despite the growth in suppliers with over 250,000 customer accounts, an increasing number of customers are now with suppliers below the threshold, meaning that fewer customers are with obligated suppliers than at the start of the scheme; at the end of 2017, for example, 94% of customers were with obligated suppliers[119], a fall of around five percentage points from the 99% coverage at the start of the scheme.

144. Obligated energy suppliers have told BEIS that they pass their ECO costs onto their consumers' energy bills, so the reduction in the number of customers with obligated suppliers means the annual £640m supplier spend is being passed on to fewer customers. This, in turn, means more ECO costs are passed on to the average customer than at the start of the scheme. Furthermore, as suppliers can promote and install energy efficiency measures into any eligible household (regardless of whether it is one of their customers or not), customers of non-obligated suppliers can benefit from the policy, without incurring the costs.

145. This is significant as recent research[120] finds that those least likely to switch suppliers (and therefore most likely to be with obligated suppliers) are more likely to be of a lower socio economic status, live in the private or social rented sector, or be on a low income – therefore making those with obligated suppliers more likely, and those with non-obligated suppliers less likely, on average, to be at risk from fuel poverty, making ECO increasingly regressive in the way it is funded.

146. The Government has therefore decided to lower the threshold at which suppliers become obligated from 250,000 customer accounts at present, to 200,000 customer accounts from April 2019 and 150,000 customer accounts from April 2020. This phased reduction in the threshold is intended to give suppliers between 150,000 and 249,999 customer accounts time to prepare to deliver the scheme.

147. To further mitigate the impact on these newly obligated suppliers the Government will adjust the tapering approach for newly obligated suppliers, which will reduce the size of the supplier's target when they first become obligated. More detail on the impact of both changes is outlined below.

Impact of lowering the threshold

148. BEIS analysis of the latest available Ofgem market data suggests that lowering the threshold to 200,000 customer accounts would increase the number of obligated suppliers from 16 to up to 20[121] (four more than had a 250,000 customer account threshold been maintained under ECO3); a further reduction in the threshold to 150,000 customers would obligate up to 27 energy suppliers (11 more than with a 250,000 customer threshold), increasing the market coverage of energy suppliers obligated to around 99%[122], around the same percentage as at the start of ECO.

[116] The Big Six are British Gas, Scottish Power, SSE, E. ON, Npower, and EDF
[117] Source: Cornwall
[118] The predecessor to ECO, the Carbon Emissions Reduction Target and Community Energy Saving Programme had a customer threshold of 50,000 customer accounts until 2011, when the threshold was raised to 250,000.
[119] Source: Market data provided by Ofgem
[120] https://www.ofgem.gov.uk/publications-and-updates/consumer-engagement-survey-2017
[121] The analysis undertaken in this section is based on customer accounts only. Some suppliers may have enough customers, but not aggregate gas or electricity supplied, to become obligated. Once obligated, the volume of gas or electricity determines the impact on individual suppliers.
[122] These numbers differ slightly from those given in the latest Warm Home Discount IA, as they are based on more recent Ofgem data.

Table 13: Impact of lowering the ECO thresholds on the number of obligated suppliers

	250,000 Customer Threshold	200,000 Customer Threshold	150,000 Customer Threshold
Number of Obligated Suppliers	16	20	27
Market Coverage (Obligated Suppliers)	94%	96%	99%

Policy Scope

149. BEIS analysis of the impact of reducing the threshold on small and micro businesses[123] suggests that no small or micro businesses are expected to be drawn into scope. The analysis[124] found that, on average, energy suppliers with 200,000 – 250,000 customer accounts employed more than 200 employees each (in March 2017). Meanwhile suppliers with 150,000 – 200,000 customer accounts (in December 2017), for which BEIS has data, employed around 120 employees. To pass the alternative threshold for being a medium or large company (£50m per annum turnover) would require an energy supplier with 150,000 customer accounts to generate revenue of around £650 per dual fuel bill per year, around half the national average for a dual fuel bill of around £1,200[125]. This suggests that it is unlikely that any additional suppliers that become obligated in under ECO3 will qualify as small or micro businesses[126].

150. Newly obligated suppliers are expected to incur costs because of becoming obligated under ECO. These would fall into two categories – administrative costs and delivery costs. As outlined above, these are expected to be passed onto their consumers through their energy bills.

151. For newly obligated suppliers, the administrative costs of complying with ECO would form a combination of fixed costs (such as setting up the required IT system) and variable costs, such as staff time. To give an indication of the potential range of administration costs that suppliers might incur because of becoming obligated under ECO, BEIS has analysed the administration costs incurred by suppliers outside the Big Six in the first year they became obligated.

152. The analysis reveals that the administration costs incurred by newly obligated suppliers ranged from a high of around £230,000 to a low of £7,000[127], with the median costs incurred being around £65,000 over the first year. BEIS believes that this median administration cost represents a conservative estimate of the administration costs that suppliers may incur per year (given the scheme simplifications that have been introduced since some of these suppliers have become obligated, and the new tapering mechanism – outlined below – which will reduce the initial size of newly obligated suppliers' share of ECO).

153. These administrative costs would come on top of the estimated £4,500 costs per supplier per year of delivering the Warm Home Discount[128]. Combined, these costs (around £70,000 per supplier per year) would amount to fewer than 2.5 full time equivalent workers[129] and would

[123] Small businesses are defined as those with less than 50 employees and micro those less than 10 employees. https://www.gov.uk/government/groups/better-regulation-executive

[124] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/716463/Warm_Home_Discount_FS_IA_Signed.pdf

[125] https://www.theccc.org.uk/publication/energy-prices-and-bills-report-2017/

[126] It is possible that the group of suppliers that will become newly obligated in 2019 and 2020 comprise different suppliers to those that we currently expect to become obligated as a result of the threshold change. However, we expect that their profiles will be broadly similar to those of suppliers that currently would be brought into scope. Therefore, we do not expect that any additional suppliers with 150,000 – 249,999 customer accounts would qualify as small or micro businesses.

[127] The low end of this range are for suppliers that have outsourced or sold their obligation, the upper end of the range is for rapidly growing suppliers that became obligated when ECO was larger (i.e. required a higher level of spend) and more complex (required greater admin to comply with the scheme rules).

[128] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/716463/Warm_Home_Discount_FS_IA_Signed.pdf

[129] Based on the median full time wage in the UK in 2017 of around £29,000, according to the 2017 Annual Survey of Hours and Earnings (ASHE). ASHE wages do not account for additional staff costs such as employee National Insurance and pension

entail a company with 150,000 customer accounts passing on costs of less than £1 per dual fuel customer per year.

154. Newly obligated suppliers, however, will also incur the costs of delivering the scheme (or the costs of selling their obligation to another supplier). These costs are likely to variable (i.e. increasing with the size of the obligation). Here, the new ECO tapering mechanism, which incrementally increases the size of the obligation for customers over the minimum threshold, is likely to reduce the initial delivery costs for newly-obligated suppliers.

155. Under the new taper, larger energy suppliers are likely to have a larger share of the obligation than their market share, and smaller suppliers a smaller share. For example, using the latest Ofgem data, BEIS estimates that the share of the obligation going to the largest six suppliers is around 85% compared to a market share of around 80%, while the 12 newly obligated suppliers would have a combined obligation share of 1% but a market share of around 5%. The would result in smaller costs per customer for smaller suppliers than larger ones.

156. Assuming the same delivery costs per lifetime bill saving, this would mean that the smallest 12 suppliers might pass on an average of £6-£7 of ECO costs per dual fuel customer per year[130], while for the six largest it would be closer to £25-27 (this is around the same level as under ECO at present). However, the ECO costs passed onto the average consumer would be expected to grow should the suppliers become larger[131]. These delivery costs come on top of the £14 per dual fuel customer per year for delivering the Warm Home Discount[132], and administrative costs of ECO[133], totalling around £22 per dual fuel customer per year (compared to just over £40 for the six largest energy suppliers).

Competition impacts

157. ECO imposes costs on obligated suppliers, which come on top of those under Warm Home Discount. As outlined above, the costs are expected to be around £22 on average for newly obligated suppliers when the threshold is lowered to 150,000 in April 2020. These additional costs come at a time when consumers appear increasingly likely to switch: 17% of households switched energy supplier in 2017, the highest level since 2011, with 91% of switchers doing so primarily to save on their energy bills[134]. These increased costs could therefore provide customers of newly obligated suppliers with an incentive to switch to suppliers with fewer than 150,000 customer accounts, who would remain non-obligated, thus reducing newly obligated suppliers' ability to compete on price[135].

contributions, which will increase the staff costs per worker. Therefore £70,000 being equivalent to 2.5 full time equivalent workers is likely to be an underestimate of the staff equivalence.

[130] The Household Energy Efficiency National Statistics provide the average, highest and lowest delivery costs per supplier. The £7 figure is calculated using the average score. Should newly obligated suppliers deliver at the highest delivery costs, the cost would be closer to £8-£9 per dual fuel customer per year.

[131] As the new tapering mechanism reduces the share that goes to the smaller suppliers (compared to the current tapering mechanism), the benefits (in terms of making the policy more progressive in the way it is funded) will initially be offset. Should newly obligated suppliers continue to grow, however, the share of ECO going to these suppliers will grow, and the share going to the six largest will fall, reducing the average pass through of these larger energy suppliers. As noted in the section below on the tapering mechanism, the new tapering approach is designed to reduce the market distortion created by the current ECO threshold, thereby helping these suppliers to grow.

[132] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/716463/Warm_Home_Discount_FS_IA_Signed.pdf

[133] For smaller energy suppliers, the average ECO costs passed onto consumers are smaller than those under Warm Home Discount. This is because costs per supplier are based on their market share (whereas ECO costs are based on obligation share).

[134] Ofgem State of the Market Report 2017. Available at: https://www.ofgem.gov.uk/publications-and-updates/state-energy-market-2017

[135] A few customers may have a lower incentive to switch, due to lower bills from the measures installed under ECO. However, the households targeted under ECO tend to be of lower socio-economic status and more likely to be living in the private rented sector than the population as a whole (see Annex F). As discussed in earlier in this section, these households are less likely to switch energy suppliers.

158. That said, there are many aspects of competition aside from price, such as customer service and product differentiation[136].

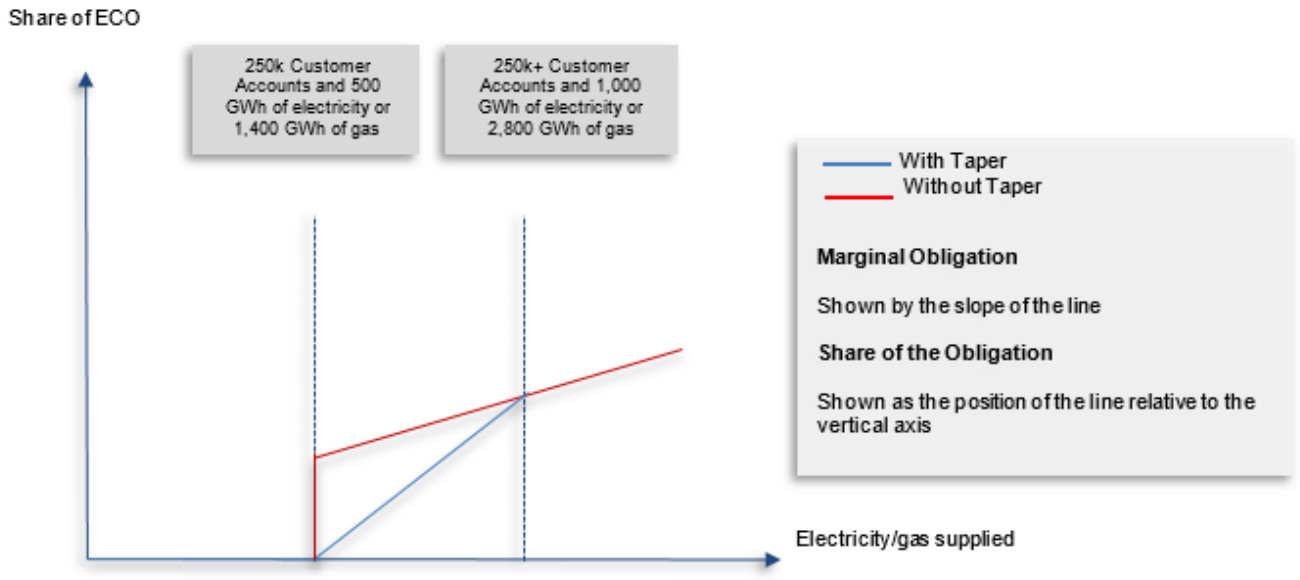
ECO Taper

159. The Government recognises that crossing the ECO threshold and becoming obligated can result in additional costs being borne by newly obligated suppliers, and these costs will be passed onto their customers through their bills[137]; it can also take time for suppliers to put the systems and expertise in place to deliver the obligation on a large scale[138].

160. 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, under the existing tapering approach (using the new supplier thresholds) when a supplier reaches 501 GWh of electricity, the full amount will not count towards its obligation share, only the volume above 500 GWh multiplied by 2 will count (i.e. only 2 GWh will count in this case). The full volume of supply is counted when the supplier reaches 1000 GWh of electricity or 2,800 GWh of gas.

161. The impact of the ECO Taper is illustrated in Figure 3 below. The red line shows how a newly obligated independent supplier's obligation share would grow if ECO did not operate with a taper. Under this scenario, a 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 2,800 GWh limit as their market size grows.

Figure 3: Existing Taper Mechanism vs no Taper



162. Some smaller suppliers have argued that the current level of the threshold and taper still represents a barrier to growth, as evidenced by their tendency to remain below 250,000 customer accounts, before rapidly expanding (see Table 14 below, which shows suppliers are either under 250,00 customer accounts or over 400,000 – illustrating the rapid expansion when suppliers cross the ECO threshold) and that in order for small suppliers to grow (and compete

[136] Ofgem State of the Market Report 2017. Available at: https://www.ofgem.gov.uk/publications-and-updates/state-energy-market-2017
[137] The assumption that energy suppliers will pass through the costs of ECO onto their customers through their energy bills has been corroborated through discussions with obligated suppliers.
[138] Independent suppliers have the option of outsourcing some elements of the admin costs. However, some costs will still be incurred.

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.

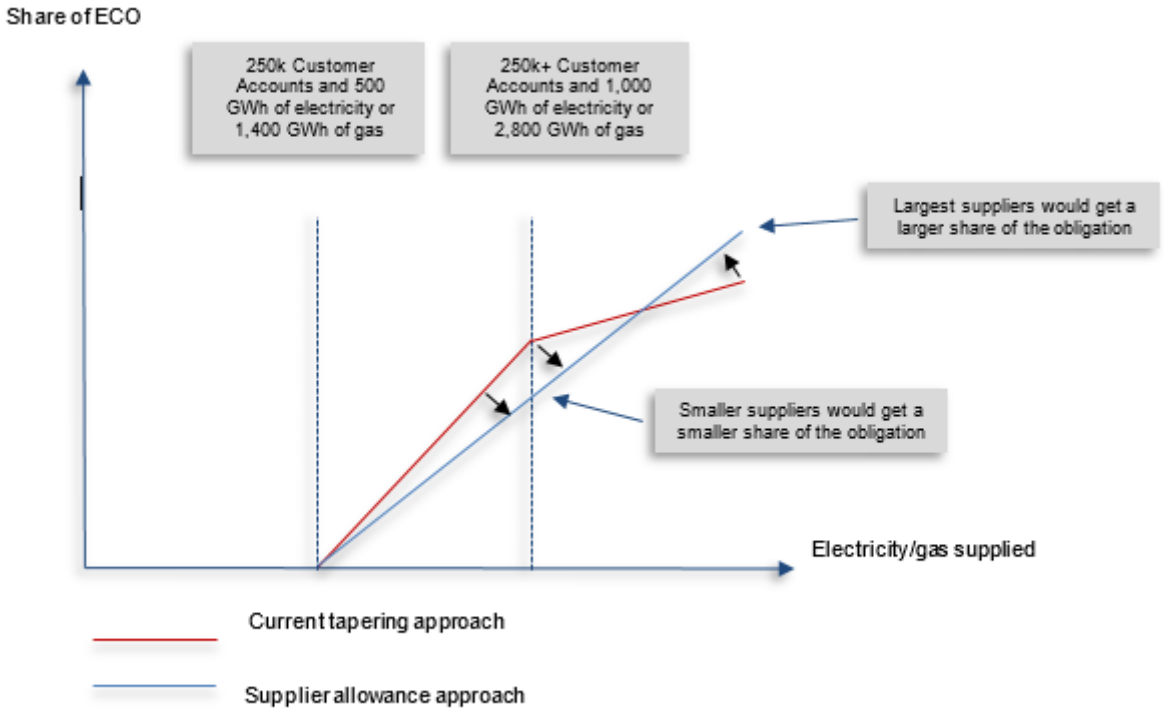
Table 14: Distribution of Customer Accounts (for Suppliers with over 150,000 Customer Accounts)[139]

Customer Accounts	Number of Suppliers
1m +	9
500 - 900	4
400 - 500	2
250 - 400	0
200 - 250	5
150 - 200	7

163. For ECO3, and following strong support from stakeholders, Government proposes to introduce an alternative taper mechanism, which is based on a 'supplier allowance' approach[140]. Under this approach, all energy suppliers would be entitled to the same 'supplier allowance' (equal to the threshold), after which their obligations would be calculated on a per unit of supply basis. This approach would address the current problem of a steeper gradient for smaller suppliers subject to the taper, and thus reduce the size of the obligation for suppliers when they first become obligated, reducing the disincentive to expand.

164. The new taper will be introduced from April 2019, when the threshold is lowered to 200,000 customer accounts.

Figure 4: Proposed New 'Supplier Allowance' Taper Mechanism



[139] Source: Ofgem
[140] 40% of stakeholders supported the supplier allowance taper, with only 9% disagreeing; 51% expressed no view.

165. BEIS analysis (based on suppliers' current customer accounts) suggests that the supplier allowance approach would increase one supplier's share of the obligation by up to 0.6 percentage points from April 2020, while decreasing the share of the obligation going to the smallest suppliers (that are currently obligated) by up to -0.3 percentage points. The largest increase and decrease relative to the current 250,000 threshold with the current tapering mechanism are shown in Table 15 below[141].

Table 15: Largest increase or decrease for an individual supplier, relative to the 250k threshold with the current tapering mechanism

	Largest Increase (ppts)	Largest Decrease (ppts)
200k Supplier Allowance versus 250k threshold with Current Taper	1.20%	-0.40%
150k Supplier Allowance versus 250k threshold with Current Taper	0.60%	-0.30%

[141] As noted earlier in this section, the percentage point changes in the obligation are based on customer accounts only. Including the volume of electricity and gas supplied may change the percentages shown slightly.

Annexes

Annex A – Further Policy Details

Further Policy Details

166. The following section provides more detail on the final policy position, as outlined in the consultation response.

Eligibility

167. The Affordable Warmth eligibility under the ECO3 covers[142]:

- private tenure households in receipt of certain means-tested benefits, or combination of benefits, sometimes needing to have a household income below a set threshold;
- private tenure households identified by a local authority as living on a low income and vulnerable to the cold or in fuel poverty; and
- households in social tenure households living in properties with an energy performance certificate rating of E, F or G, for certain measures.

168. The consultation response also outlines that ECO3 will:

a. Retain the ECO2t suite of means-tested benefits in use for determining eligibility of private tenure households and increase the eligibility criteria to include other categories of non-means tested benefits, Child Benefit, disability and disability-related benefits, including Ministry of Defence related benefits.

b. Require households that are eligible through Child Benefits to have an (equivalised) income below £25,500 per year (for a couple with a dependent child).

c. Remove the equivalised income thresholds for households in receipt of Child or Working Tax Credit, and Universal Credit (see Section 5.5).

d. Extend eligibility to social housing properties with an EPC Band D rating for measures delivered under the two innovation routes.

Rural Safeguard

169. The consultation response outlined that the rural safeguard under ECO3 will be the equivalent of 15% of the total obligation, as the Government remains committed to ensuring that the scheme continues to deliver measures in rural areas.

A Broken Heating System Replacement Cap

170. A cap on replacement gas boilers was introduced under the ECO2t scheme, at the equivalent of 25,000 boilers per year. The ECO3 scheme will increase this cap to the equivalent of around 35,000 heating systems per year, and widen the definition to encompass all broken heating system replacement measures, excluding renewable, district heating systems and heating controls. Oil boilers will be eligible under this part of the scheme.

171. Inefficient heating systems will also be able to be replaced (or upgraded) if installed alongside an insulation measure (such as wall insulation[143]). This will fall outside the cap.

Solid Wall Homes Minimum

172. The response to consultation has set a solid wall homes minimum equivalent of £0.721bn of notional lifetime bill savings; this is equivalent to 17,000 SWI installations per year.

[142] See https://www.ofgem.gov.uk/system/files/docs/2017/03/ECO2t_help_to_heat_group_guidance_note.pdf for further details.
[143] A full list of eligible Insulation measures is contained within the accompanying consultation document.

Local Authority Flexible Eligibility

173. BEIS introduced local authority Flexible Eligibility in the Affordable Warmth part of the ECO2t scheme. This voluntary element allows local authorities to publish a Statement of Intent setting out households that are eligible for ECO support in their area. Energy suppliers can then meet part of their targets by working with local authorities to deliver measures to eligible households.

174. Flexible Eligibility was capped at 10% of the Affordable Warmth targets under ECO2t. Under ECO3, the cap has been increased to 25% allowing suppliers to deliver up to 25% of their obligation through this route if they consider it cost-effective.

Innovation

175. The Government has decided that obligated suppliers should be able to meet up to 10% of their total obligation through innovation.

176. There will be two Innovation routes under the scheme:

- Demonstration Actions – providing support for measures that have been tested in a laboratory and now require testing in a live environment; and

- Innovation score uplifts – providing support for measures that have not previously been delivered under the obligation and where they can demonstrate that their installation methods, material fabric and/or other techniques can drive down delivery costs and improve the energy efficiency of the property.

177. Delivery under Innovation would count towards scheme minima, and, where delivered through Flexible Eligibility, the Flexible Eligibility cap.

178. The scheme will also allow in-situ performance of energy efficiency measures – using monitoring equipment to monitor how the measure performs when it is installed to assess actual energy savings.

Annex B – Evidence Base

179. The section below outlines some of the key evidence and assumptions underpinning this IA. The Government welcomes feedback on these assumptions to inform future energy efficiency policy development.

Insulation and Heating Costs

180. The insulation cost assumptions underpinning this IA are shown in the table below. These are based on the updated assumptions collected during late 2016, and presented in the ECO2t final stage IA[144]. They are predominantly based on a report produced by Cambridge Architectural Research (CAR) for BEIS[145]. 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)[146].

Table 16: Capex Assumptions – Insulation Measures (£, real 2017 prices) [147]

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	>117.03
Detached - Small	680	2,300	310	10,200	<117.03
Bungalow - Large	760	3,700	640	10,400	>117.03
Bungalow - Small	540	2,300	310	9,200	<117.03
Semi-detached/End of Terrace - Large	660	4,300	370	8,400	>80.45
Semi-detached/End of Terrace - Small	529	2,700	230	7,800	<80.45
Mid Terrace - Large	505	4,300	340	7,500	>75.5
Mid Terrace - Small	460	2,700	220	6,800	<75.5
Flat - Large	430	2,500	430	6,700	>54.29
Flat - Small	380	1,600	180	5,300	<54.29

181. Since the publication of the ECO2t final stage impact assessment, BEIS commissioned Delta Energy and Environment to review and update its heating measure cost assumptions. These were presented in the consultation stage IA[148].

182. In their responses to the ECO3 consultation, stakeholders commented that the capital costs BEIS had included in the consultation stage IA for the capital costs for boilers and first-time central heating systems were higher than those being installed under ECO2t, and that these costs would not be expected to rise during ECO3.

144 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586266/ECO_Transition_Final_Stage_IA__For_Publication_.pdf

145 https://www.gov.uk/government/publications/domestic-cost-assumptions-what-does-it-cost-to-retrofit-homes

146 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.

147 These costs are based on research carried out by Cambridge Architectural Research https://www.gov.uk/government/publications/domestic-cost-assumptions-what-does-it-cost-to-retrofit-homes and the Energy Savings Trust https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/656865/160628_Non-standard_cavity_walls_and_lofts.pdf

148 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/696443/ECO_3_Consultation_Stage_IA.pdf

183. As a result, the Department has decreased its assumed costs for boilers and first-time central heating, with the costs of a 24kW gas boiler (first time central heating system) reduced from £2,500 to £2,000 (£5,600 to £3,400), while for 30kW the costs have been reduced from £2,600 to £2,500 (£5,900 to £4,200).

184. BEIS has also expanded the schedule of costs to other boiler sizes, not just the 24KW and 30KW presented in the consultation stage IA, as was the case in the ECO2t final stage IA, to reflect the mix of boiler sizes installed under ECO. Given the decision to retain oil boilers as an eligible measure, the assumed oil boiler costs (derived from the Delta Energy and Environment study) are also shown below.

Table 17: Gas and Oil Boiler and Gas First Time Central Heating installation costs by boiler capacity[149] (£,2017)

Heating Measure/ Capacity	Gas Boiler (£)	Oil Boiler (£)	Gas First Time Central Heating
12	£1,500	£2,100	£2,600
15	£1,600	£2,700	£2,800
18	£1,700	£2,700	£3,000
24	£1,900	£2,700	£3,400
28	£2,000	£2,900	£3,700
30	£2,200	£2,900	£4,200
32	£2,300	£2,900	£4,500
36	£2,600	£2,900	£5,100
40	£2,900	£3,300	£5,600
44	£3,200	£3,600	£6,200
48	£3,500	£3,900	£6,800
52	£3,700	£4,200	£7,300
56	£4,000	£4,600	£7,900
60	£4,300	£4,900	£8,400

185. The assumed costs of electric storage heaters are shown below. The costs are unchanged since the ECO3 consultation stage IA.

Table 18: Assumed Electric Storage Heater Costs by Number of Bedrooms (£, 2017)

Number of Bedrooms	Electric Storage Heater Costs
1	£2,580
2	£3,340
3	£4,120
4	£5,440
5	£6,220

186. Consistent with previous ECO IAs, the boiler cost assumptions above have been reduced by 25% to account for the bulk discount associated with installing measures under ECO[150]. Previously, these were assumed to be resource savings (the bulk buying of boilers led to economies of scale in boiler manufacture and reductions in transportation costs). However, BEIS has received little evidence to support this assertion, meaning it now assumes that the bulk discount is due to suppliers being able to squeeze installers' margins (a transfer). This will reduce the societal benefits of the policy slightly, although the reduced boiler cost to households are still counted when considering 'who pays' when the policy costs and benefits are equity weighted.

Capex assumptions – Renewable Heating

[149] Research conducted by Delta EE suggested that the vast majority of new boiler installations are of either 24 or 30 kW capacity. We have therefore assumed these sizes of installations for the consultation stage IA.
[150] The bulk discount is the reduced resource costs because of economies of scale achieved through the bulk buying of boilers under the ECO scheme.

187. The table below shows our central capex assumptions for domestic 10kW heat pumps used in the Affordable Warmth modelling. This is based on Sweett Group evidence collection from 2013[151], and is consistent with the assumptions used in recent Renewable Heat Incentive Impact Assessments[152].

188. Due to the relatively high upfront cost the modelling does not lead to any anticipated deployment during ECO3, therefore we only show an illustration of the costs assumed here.

Table 19: Illustration of the capex assumed for renewable heat measures (£, 2017 prices)

Capacity (kW)	Ground Source Heat Pump (£)
10	19,700

Technical Potential

189. The technical potential assumptions under the preferred option are shown in Table 20, below, which are based on the technical potential provided in the English Housing Survey, but adjusted downwards to account for estimated delivery to these homes to September 2018. The remaining technical potential is slightly higher than those presented in the ECO3 consultation stage IA, reflecting the inclusion of an additional 500,000 households BEIS estimates to be eligible under ECO Flexible Eligibility (see Annex I).

Table 20: Remaining Technical Potential

Technology	Remaining Potential in Eligible Group (Millions)
Cavity Wall Insulation	1.3
Loft Insulation	1.4
Room in Roof Insulation	0.18
Solid Wall Insulation	2.2
First Time Central Heating	0.16

190. The remaining loft insulation 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).

191. The remaining cavity wall insulation potential figures exclude cavities defined in BEIS statistics as having limited potential.

Natural Boiler Replacement costs

192. Households are assumed to replace their boilers once they reach a certain age, with or without policy intervention, which we refer to as 'natural replacements'. These natural replacements will be sourced and funded by individual households, which are likely to be costlier than if the replacement was 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.

193. BEIS assumes that suppliers or their installers can deliver boilers at 75% of the cost that householders would face if replacing the boiler themselves. This is based on observed delivery cost data from previous Government sponsored energy efficiency schemes.

[151] Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/204275/Research_on_the_costs_and_performance_of_heating_and_cooling_technologies__Sweett_Group_.pdf

[152] Available at:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505132/Consultation_Stage_Impact_Assessment_-_The_RHI_-_a_reformed_and_refocussed_scheme.pdf

194. Additionally, we assume that households must pay VAT of 20% on top of the cost of the new boiler if replacing it themselves, whereas we assume that suppliers are not required to pay VAT on subsidised boilers under Affordable Warmth. We do not include the cost of VAT in regular cost benefit analysis calculations as it represents a transfer rather than a cost. However, we do include transfers in equity weighted cost benefit analyses as 'who pays' then becomes a consideration.

Administrative cost assumptions

195. Administrative costs fall into two categories – those faced directly by suppliers, and those that are likely to be faced by the supply chain in finding Affordable Warmth eligible households. The supplier administrative costs assumed are set out in Section 9.

196. In addition to the supplier administration costs, we also include the search costs involved in finding Affordable Warmth eligible households and estimate separately the cost of warranties that accompany replacement boiler installations – a requirement under ECO since 2014:

- **Boiler warranty costs:** The cost of a warranty required with boiler replacements from 2017 onwards is estimated to be £130 per year, in line with assumptions from the ECO2t Impact Assessment[153]

- **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 eligible. In many cases these costs will be first incurred by the installer who will pass the cost on to the supplier. This can entail paying third parties for referrals and additional specifically-targeted marketing, among other approaches.

197. The assumed search costs underpinning this IA, and their percentage change from those used in the consultation stage IA, are shown in Table 21, below. The updated cost assumptions are derived from the supply chain survey and stakeholder feedback. All search costs are per successful install (for example, if two eligible households needed to be found per successful install than the costs of finding both households are presented below).

Table 21: Assumed Search Costs (and difference from the search costs assumed in the consultation stage IA) [154]

Measure	Homes on the gas grid (£)	Percentage Change	Homes off the gas grid (£)	Percentage Change
Cavity Wall Insulation	240	92%	400	0%
Loft Insulation	180	44%	400	0%
Room in Roof	220	76%	400	0%
Solid Wall Insulation	270	116%	400	0%
Central Heating	280	124%	620	55%
Broken Replacement Boilers	130	160%	620	107%
Working Replacement Boilers	130	4%	620	55%
Ground Source Heat Pump	240	92%	400	0%
Air Source Heat Pump	240	92%	400	0%
Biomass Boilers	130	4%	620	55%
Storage Heater	280	124%	620	55%
Storage Heater Upgrade	280	124%	620	55%

[153] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/534669/ECO_Transition_Consultation_IA.PDF
[154] Source: BEIS Supply Chain Survey.

Measure	Homes on the gas grid (£)	Percentage Change	Homes off the gas grid (£)	Percentage Change
Heating Controls	0	0%	0	0%
Solar Thermal	240	92%	400	0%
Solar PV	240	92%	400	0%

Hidden costs of installing measures

198. Table 22, below, shows the estimated hidden costs of installing measures, which are applied to the Affordable Warmth model. 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 estimates are based on the ECOFYS report of domestic energy, uprated to 2017 prices[155]. BEIS did not receive challenge to these assumptions from stakeholders.

199. For Affordable Warmth modelling, these costs are only included in cost-benefit analysis – they do not form part of supplier delivery costs.

Table 22: Estimated hidden costs of installing measures (£,2017)

Measure	Hidden Cost (£/installation)
Cavity Wall Insulation	115
Loft Insulation	145
External Solid Wall Insulation	235
Replacement Boiler	70
First Time Central Heating	125
Ground Source Heat Pumps	255
Air Source Heat Pumps	200

Operation costs/expenditure (Opex)

200. Opex relates to the annual cost of running heating measures, and includes servicing and maintenance costs, but not the fuel costs. Opex is assumed to be fixed at £100 per year for each heating measure (excluding heating controls). These costs are included in cost-benefit analyses only – they do not form part of supplier delivery costs, as they are assumed to fall to the householder.

Third Party Funding

201. BEIS has updated its assumed co-funding of solid wall insulation and gas boiler replacements based on the evidence received through the supply chain survey, which has been corroborated through discussions with stakeholders and bottom up analysis of current ECO2t market prices[156]. The updates are presented in the table below.

[155] ECOFYS (2009). *The Hidden Costs and Benefits of Domestic Energy Efficiency and Carbon Saving measures*. Available at: 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

[156] That is considering discrepancy between the assumed market price had suppliers paid the full cost of the measure, and the prevailing market price, as reported in the department's Household Energy Efficiency National Statistics.

Table 23: Assumed co-funding for solid wall insulation and gas boilers

	Assumed Co Funding Per Measure (Consultation IA Assumption)	Assumed Co Funding Per Measure (Final IA Assumption)	Approximate Co Funding Per Year (Percentage co funding * number of measures * measure cost)
Solid Wall Insulation	33%	75%	£100m
Gas Boilers	~3%	25%	£15m

202. The table shows that BEIS estimates co-funding for solid wall insulation and gas boiler replacements of around £115m per year.

203. The vast majority of this funding was expected to come from the Scottish Government's £500m package to tackle energy efficiency and fuel poverty in Scotland, around 80% of which can potentially be blended with ECO[157]. However, greater funding is also expected from local authorities than assumed in the ECO3 consultation stage IA, given the results of the supply chain survey (see below).

Other Key Assumptions

Measure Lifetimes

204. The assumed lifetimes of measures are a key assumption as they determine the extent to which measures continue to have an impact beyond their initial installation, and therefore the overall costs and benefits. Table 24, below, shows the assumed measure lifetimes for cost benefit analysis.

Table 24: Assumed lifetime of measures

Measure	Lifetime
Cavity Wall Insulation	42
Loft Insulation	42
Solid Wall Insulation – External	36
Replacement Boiler – Gas[158]	3
Replacement Boiler – Oil[159]	3
First Time Central Heating – Gas	12
Ground Source Heat Pump	20
Air Source Heat Pump	15
Heating Controls	Same as heating measures the controls are installed with

Source: BEIS

Supply Chain and Local Authority Survey

205. To better understand the co-funding that suppliers have available to them when promoting and installing energy efficiency measures under ECO, BEIS created a quarterly survey, which it distributes to installers, managing agents[160] and local authorities.

206. Specifically, the survey is aimed at improving the Department's understanding of:

[157] See http://www.gov.scot/Publications/2017/01/2195/4
[158] For private tenure households. The lifetime is assumed to be zero years for social housing.
[159] For private tenure households. The lifetime is assumed to be zero years for social housing.
[160] Parties contracted to deliver the ECO obligation on behalf of energy suppliers.

1. The source of measure funding – that is, how much suppliers, local authorities, households and the Scottish and Welsh Governments are contributing towards the cost of ECO measures;
2. Search costs; and
3. Supply chain and local authority administration costs

207. The survey looks to break down (1) and (2) by measure (e.g. cavity wall compared to loft) and obligation type (i.e. CERO compared to Affordable Warmth), and (3) by obligation type.

208. It also distinguishes between measures delivered under the main part of Affordable Warmth and those delivered under Flexible Eligibility, helping to improve the Department's evidence on the costs of using Flexible Eligibility.

209. To date, around 56 responses have been received, covering around £55m of ECO spend.

Interest Rates on Private Funding ('Opportunity Cost of Capital')

210. 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.

211. The Committee on Climate Change has previously undertaken research on the appropriate means of estimating the opportunity cost of capital where private funds are used to achieve social aims[161]. They found that the appropriate rate for individual financing of social aims was in the region of 3.5% to 7.5%. The mid-point of this range, 5.5%, is assumed to be the private interest rate.

212. Supplementary guidance to the Green Book, 'valuing energy use and greenhouse gas emissions'[162] advises that "the costs of private financing would generally be considered to be a real social cost". This is because financing costs may affect private sector allocation decisions. When capital is tied up in a specific project, alternative profitable use of such capital is ruled out. The cost of capital should reflect the best alternative return on the capital i.e. the opportunity cost, comprising two elements. Firstly, an element that is equal to a risk-free return (the social discount rate). Secondly, a risk premium should be added to express the undiversifiable risk-adjusted opportunity cost of capital i.e. the return foregone in the financial market on an investment with the same presumed risk profile. This approach is in line with the Green Book which supports adjustment of cash flows to account for risk rather than adjustment of the social discount rate. Finance costs have been included in this final stage impact assessment, ensuring consistency with this guidance and with previous related BEIS ECO IAs[163]. The inclusion of private financing costs reduces the NPV and represents a prudent approach to avoid overestimating net benefits of the policy. Some elements of the financing costs will be a transfer, for example, profit and taxation. It has not been possible to separate these out due to the lack of data, so financing costs are likely to be an overestimate.

213. Opportunity cost of capital is applied to boilers, as there is clear evidence (for example, through the supply chain survey) that the household contributes towards the cost of these measures[164].

Equity Weighting

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

[162] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/671205/Valuation_of_energy_use_and_greenhouse_gas_emissions_for_appraisal_2017.pdf

[163] See, for example, the Future of ECO Final Stage IA https://www.gov.uk/government/consultations/the-future-of-the-energy-company-obligation

[164] The opportunity cost is applied while the boiler is deemed additional under ECO (i.e. the first three years of the boiler lifetime). In the case of solid wall insulation, it appears that much of the co funding comes from local authorities or the Scottish Government.

214. In line with the *Green Book*[165] BEIS applies equity-weights to its cost-benefit analysis to value the distributional impact of the policy. Equity weighting accounts for the difference in value that a household in a lower income group places on £1 of cost or benefit compared to a household in a higher income group.

215. Since the publication of the consultation stage IA, a new version of the Green Book has been published, with a new equity weights. These, and how they compare to those presented in the consultation stage IA, are in Table 25, below. They are based on After Housing Cost Equivalised (AHCeq) income. AHCeq income is estimated using data from the 2013 Fuel Poverty Analytical Dataset, which itself is based on the 2013 English Housing Survey.

[165] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent. The formula contained in the Green Book has been used to derive the equity weights contained in this IA.

Table 25: Equity Weights using After Housing Cost Equivalised Income

Decile	Equity Weight [Consultation]	Equity Weight [Final]
1	3.6	5.3
2	2.0	2.4
3	1.5	1.7
4	1.3	1.4
5	1.1	1.1
6	0.9	0.9
7	0.8	0.7
8	0.7	0.6
9	0.5	0.4
10	0.4	0.3

216. Using the equity weights, an additional £1 for *any* household in the lowest income decile group would be valued at £5.3, whereas an additional £1 to *any* household in the highest income decile group would be valued at £0.3.

217. Table 26 provides a summary of where equity-weights are applied in the cost-benefit analysis. Equity weights are applied to the costs passed through to energy consumers (installation costs (including economic rents / 'excess subsidy') and administration costs), to comfort taking, economic rents / 'excess subsidy' accruing to households, and to the societal benefit from lower income households benefiting from lower energy bills.

Table 26: Description of the application of the equity weights to the different costs and benefits

Cost/ Benefit Category	NPV (not weighted)	Equity-weighted NPV
Installation Costs	This covers the capital cost of measures installed. No economic rent / 'excess subsidy' is counted, as this represents a transfer from one group to another with no net cost or benefit.	This is weighted according to the distribution of gas and electricity bill payers across the income scale.
Economic rent that suppliers pay to households or the supply chain	This represents the difference between the measure installation costs and the market price for installing the measure, and therefore represents the excess subsidy suppliers have to pay for measures. For the purposes of this IA, we assume that any 'excess subsidy' or economic rent accrues to households receiving measures. Any excess subsidy paid to households is monetised and included as a benefit (see 'extra utility from lower bills in low income households' below), meaning the costs and benefits net to zero and leave the NPV unaffected.	This is weighted according to the distribution of gas and electricity bill payers across the income scale.
Administration Costs (including boiler warranties and search costs)	Administration costs are virtually all ultimately paid for by suppliers, and so this forms part	Administrative costs are part of the total scheme costs passed back to consumers, so this is weighted according to the

Cost/ Benefit Category	NPV (not weighted)	Equity-weighted NPV
	of the costs passed on to gas and electricity consumers.	distribution of gas and electricity bill payers.
Hidden Costs	Hidden costs of installing energy efficiency measures.	No difference from unweighted, as unclear the extent to which value of time varies across recipient households.
Value of Change in CO2e	Energy changes x emissions factors x carbon values.	No difference from unweighted, as all households benefit equally.
Value of Change in Air Quality	Energy changes x AQ damage factors.	No difference from unweighted, as all households benefit equally.
Change in Energy Use (Societal)	Energy changes x Long Run Variable Cost of Energy Supply.	No difference from unweighted, as all households benefit equally.
Comfort taking	Comfort taking kWh x retail price.	Comfort taking is achieved by forgoing bill savings in favour of greater warmth, and lower income households have a higher marginal utility of income. This is therefore weighted according to the income distribution of the households taking comfort.
Opportunity costs of capital for households	The assumed interest rate on the household funding, while the measure is deemed additional[166].	Weighted according to the income distribution of the households receiving the measures.
Costs to the administrator	The costs to the administrator (Ofgem) of administering the scheme. This is based on the average annual spend reported by Ofgem multiplied by the length of the scheme.	No difference from unweighted, as Ofgem's funding is assumed to be through taxation, and therefore assumed to be broadly shared equally amongst households[167].
Extra utility from lower bills in low income households	Forms no part of the regular NPV, as this is purely distributional.	Energy bill savings are a private benefit; however, society derives a benefit from the knowledge that low income households are benefiting from lower energy bills. This is because energy is a necessity and lower income households are constrained in how well they can meet basic energy needs, such as heating. This distributional benefit is therefore calculated as: *[Energy savings x Retail price x Equity-weight of recipient households] – [Energy savings x Retail price].*

[166] 3 years – the time period that boilers are assumed to be additional. After this time, it is assumed that the householder would have replaced their broken boiler, even in the absence of ECO. The opportunity cost of the private capital no longer applies from this point.

[167] In practice, the costs may be borne slightly more by higher income households (which would reduce the equity weighted costs). However, the difference is likely to be very small – so no change has been assumed on the grounds of proportionality.

Cost/ Benefit Category	NPV (not weighted)	Equity-weighted NPV
Value of economic rent to low Income households	This represents the difference between the measure installation costs and the market price for the measure, and therefore represents the excess subsidy suppliers have to pay for measures. For the purposes of this IA, we assume that any 'excess subsidy' or economic rent accrues to households receiving measures. Any excess subsidy paid to households is monetised and included as a benefit.	Where this accrues to lower income households, this generates a distributional benefit. Therefore, the rent (which is also weighted as part of the costs above), is weighted according to the distribution of recipient households. This means that unlike the unweighted NPV, the value of the benefit outweighs the cost to businesses, making it a net benefit overall.

Findability

218. The Affordable Warmth modelling has restrictions on how much of the technical potential the supply chain can identify and install in any single year, i.e. it assumes that suppliers can only identify a proportion of the remaining technical potential each year. To account for this, the model picks a random proportion of the remaining technical potential, with the proportion varying by measure type.

219. The assumed proportion of technical potential that is findable each year is shown in Table 27, below.

Table 27: Assumed findability rates per year during ECO3

Measure	Central
Cavity Wall Insulation	12%
Loft Insulation	16%
Room in Roof	11%
Central Heating	100%
Solid Wall Insulation	11%
Heat Pumps	100%
Storage Heaters	14%

220. Most of the findability rates are calibrated to past rates of ECO delivery[168], and are unchanged from the consultation stage IA. However, for this IA, the assumed findability rates for cavity and loft insulation have been calibrated to the market price over ECO3 (see below) rather than delivery rates[169].

221. The rationale for changing the findability rates for lofts and cavities was that they were leading to high levels of economic rent, and, as a result, to very high market prices for these measures[170]. BEIS therefore felt that calibrating to market prices was a more reasonable starting point[171].

[168] Calibrating the findability rates to delivery involves analysing how many of each measure type suppliers have installed annually under ECO over the last few years, and comparing that to the remaining technical potential (based on the eligible pool at ECO at the time that the measures were installed).
[169] That is, vary the findability rate until cavities and lofts were being delivered at a pre-determined price level. The determination of the price level is discussed in more detail below.
[170] This is because when only a small fraction of the remaining technical potential can be found each year
[171] Evidence from the supply chain survey suggests there is negligible co funding for these measures, which could have complicated the relationship between the findability rates and the modelled market prices.

222. BEIS, however, does not believe that the current market price, after removing the 30% uplift to the ECO2t scores[172], was likely to be representative of the likely market price over the course of ECO3; it expects that the volume of cavity and loft installations will increase after ECO3 comes into force, which, allied with eligible households becoming harder to find as the scheme progresses, will push up market prices.

223. To inform the assumed increase in the market price (which is uncertain), BEIS used the evolution of the market price observed in the CERT[173] Super Priority Group (SPG), a subset of the CERT extension with an eligible pool size of around 4.8m households (in England)[174], and which ran for just over 2 years.

224. According to evidence from the CERT Evaluation, the price of the CERT SPG was, on average, around 25% higher at the end of CERT than when the CERT SPG was first introduced, and nearly double at the end of CERT than when the SPG was first introduced[175]. We have assumed a similar evolution of the market price for cavities and lofts, to inform the findability rates for these measures.

Updating Eligibility Caseloads[176]

225. Since the consultation stage IA, we have updated the evidence base to reflect the latest (Spring 2018) DWP forecast of benefit caseloads during the obligation period, and adjusted the method by which we estimate the number of eligible households from the caseload of individual claimants.

226. The largest component of the difference is that about 300,000 more disability benefit claims are forecast in the latest DWP figures. Some of these will be from residents of households which are already eligible for other reasons.

Energy Savings from Installing Measures

227. The Affordable Warmth model uses underlying energy calculations from building physics models, which for the purposes of the cost-benefit analysis and associated results are calibrated to observed energy use and energy savings from installing measures.

228. The model begins with estimates of the energy needed by households to achieve the heating regimes set out in the fuel poverty methodology manual[177] according to the BREDEM2012 energy model – a similar method to SAP, but more tailored to the occupancy of the property. These energy use estimates are the same as those used to calculate fuel poverty in England.

Comfort Taking

229. When a measure is installed in a home, observed data (for example, from the National Energy Efficiency Data-Framework – NEED) typically shows a lower energy saving than standard building models would predict. Part of the reason for this is that energy efficiency measures either reduce the cost of achieving the same degree of comfort in the home, and therefore households choose to take some of this saving in the form of increased thermal comfort; or they allow a greater degree of warmth to be achieved as a result of the installation (for example, first time central heating). The additional warmth households choose to take is referred to as 'comfort

[172] Because scores are 30% higher with the deemed scores uplift under ECO2t, each pound spend installing measures will lead to a greater lifetime bill saving under ECO2t than ECO3 (which has no such uplift).
[173] The Carbon Emissions Reduction Target (CERT) was a predecessor to the Energy Company Obligation, running between 2008 and 2012. The SPG was introduced under the CERT Extension.
[174] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/326013/Detailed_tables_2012_Final.xls (Table 28)
[175] That the price at the end of the scheme was roughly double, but the average price around 25% higher reflects that prices spiked in the last few quarters of CERT.
[176] The number of households or individuals in receipt of each type of benefit.
[177] More information is available here: https://www.gov.uk/government/publications/fuel-poverty-methodology-handbook-2013

taking'. This is valued at the retail price of energy, because this reflects households' willingness to pay for additional warmth.

230. Consistent with previous ECO impact assessments, the table below lists the comfort taking assumptions used in the Affordable Warmth Model. BEIS does not assume any comfort taking in relation to boiler upgrades (where the existing system is functional) as there is at present limited evidence in relation to this. The same is assumed for ground source heat pumps.

231. In the case of replacement boilers where the existing system is broken and the low income householder cannot immediately afford to replace it, we draw on evidence from the 2008 Warm Front Evaluation[178], which showed that after the installation of heating measures (a pre-requisite for Warm Front was having either a broken boiler or no central heating system at all) homes were on average 1.5°C to 2.5°C warmer due to the level of underheating when the boiler was broken. The same assumption is made for first time central heating, given that in both instances households are likely to be heating only a section of the home.

Table 28 Comfort taking assumptions, by measure (expressed as % of saving forgone, unless otherwise stated)

Measure	Affordable Warmth Model
Cavity Wall Insulation	15%
Loft Insulation	15%
Solid Wall Insulation	15%
Non-condensing to condensing boiler	0%
Replacement for a broken boiler	Equivalent to 2˚C improvement in internal temperature
Air Source Heat Pump	0%
Ground Source Heat Pump	0%
First Time Central Heating	Equivalent to 2˚C improvement in internal temperature

Scaling Data to Represent Great Britain

232. The Affordable Warmth model is based on data from the 2013 English Housing Survey. To estimate impacts for Great Britain as a whole, outputs have been scaled up based on the ratio of the number of dwellings in England to Great Britain (1.168), calculated from official statistics[179].

Fuel poverty calculations

233. The fuel poverty impacts estimated in Section 9 are made using the methodology set out in the analytical annex to *Fuel Poverty: A Framework for Future Action*[180]. Given data constraints, the fuel poverty estimates are for England only, although we expect that similar if not greater impacts to be observed in Scotland and Wales.

[178] Warm Front, Better Health – available at: http://www.apho.org.uk/resource/item.aspx?RID=53281
[179] https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants
[180] Fuel Poverty: A Framework for Future Action, available at: https://www.gov.uk/government/publications/fuel-poverty-aframework-
for-future-action

Annex C – Affordable Warmth Model

Model Overview

234. 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. A summary of the modelling methodology applied in this Impact Assessment is set out in detail in this section.

235. The modelling approach can be broken down into the following steps:

1. Identify the technical potential for installing measures in each household
The model firstly assesses the technical potential for installing a range of major insulation and heating measures in English households. It does this based on data from the 2013 English Housing Survey (which provides characteristics of the English housing stock at that point in time) combined with suitability criteria for the different measures, the predicted measure delivery between 2013 and the start of ECO3[181], and the remaining potential according to published BEIS ECO statistics for insulation measures[182] Potential for replacement boilers is treated slightly differently, to account for households replacing their boilers in the absence of receiving a boiler through ECO (referred to as 'natural replacement') and boilers breaking down.

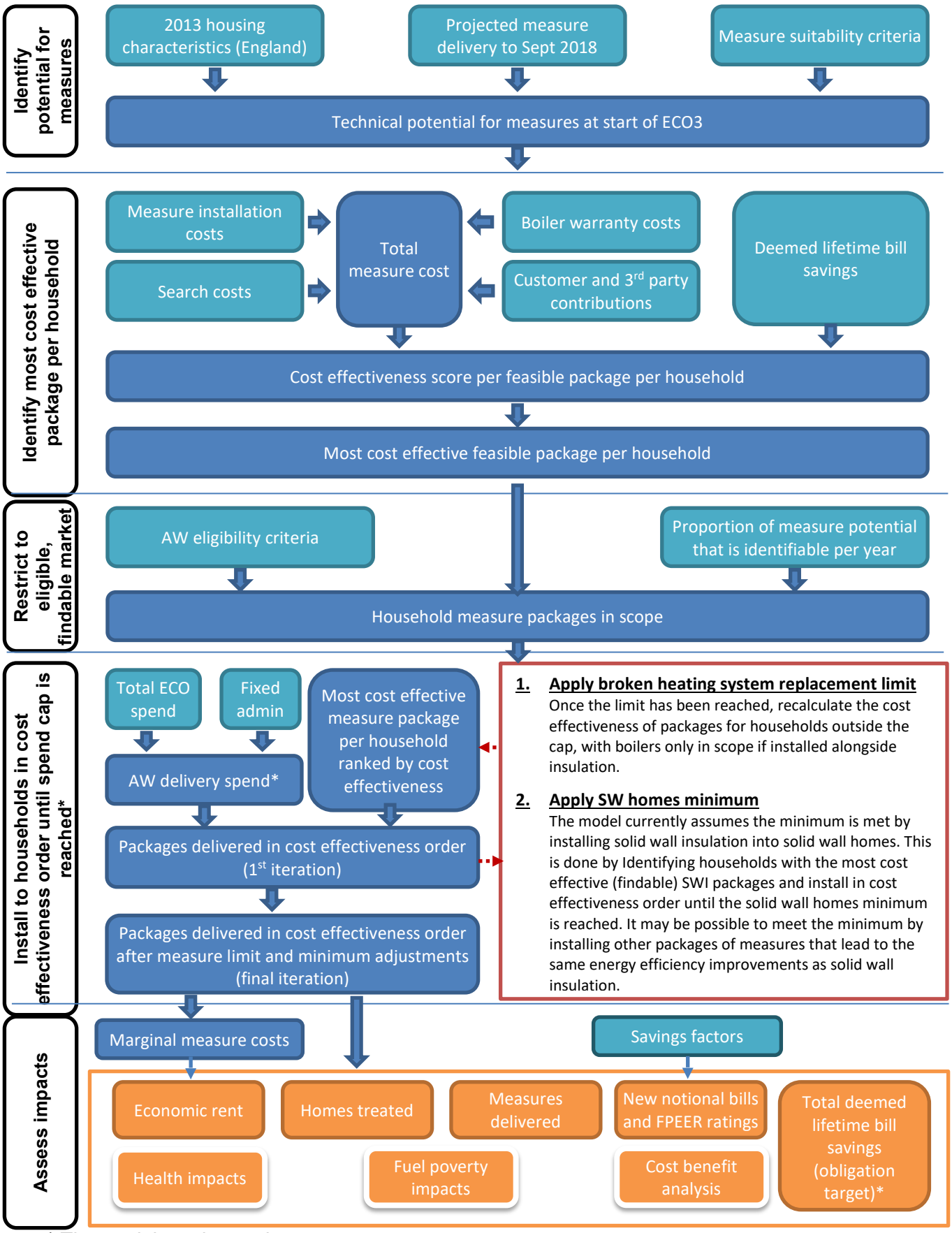
2. Identify the most cost-effective package per household
The model calculates a cost-effectiveness score for each feasible measure and package of measures for each household, based on the deemed lifetime bill savings and the cost of installing each package. This gives the cost per lifetime bill saving achieved by the package. These scores are compared across the feasible packages to find the most cost-effective package (and corresponding score) per household.

3. Restrict the market to eligible, findable households and measures
Market restrictions are applied such that only households that are 'findable' in a particular year and that meet the Affordable Warmth eligibility criteria are kept in the pool. The 'findable potential' restriction is implemented by assuming that only a certain proportion of technical potential for measures is identifiable each year, where this proportion varies by measure. For example, under central assumptions, 12% of households with potential for Cavity Wall Insulation are assumed to be identifiable. The model therefore randomly selects 12% of households whose most cost-effective measure package includes for cavity wall insulation to be kept in the pool. The remaining households whose most cost-effective measure package includes Cavity Wall Insulation are excluded.

4. Install to remaining households in cost effectiveness order until target is reached
Next, the remaining households are ranked in cost-effectiveness order based on the score for their most cost-effective package. This assumes that participating suppliers will seek to achieve the Affordable Warmth target at minimum cost. The model identifies an initial allocation of packages to households (before adjustments to ensure the limit on boiler delivery isn't breached), in cost-effectiveness order, until the target has been met. The target is based on meeting a certain level of spend, and an output of these runs is the total deemed lifetime bill savings achieved from installing the packages.

236. A fuller breakdown of the steps underpinning the Affordable Warmth Model is set out below.

[181] This is to adjust the remaining technical potential, which will be lower than in 2013 due to the measures installed between the time of the survey and the start of ECO3
[182] https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-march-2018 (see Tables 4.4 - 4.6)



* The model can be run in two ways:
1. To match a certain level of spend: this outputs an equivalent obligation target in terms of Lifetime Bill Savings
2. To match a certain obligation target (lifetime bill savings): this outputs the level of spend required to meet this target.

Affordable Warmth Sensitivities

237. The high and low values for the sensitivities outlined in Section 10 have been derived as follows.

a. High and low findability rates for loft and cavity wall insulation – the high findability rates are those that are needed to maintain the average market price for cavities and lofts currently observed under ECO2t[183], once adjusting for the removal of the deemed score uplift of 30% under ECO2t. The low findability rate is that which is required to see the average market price under ECO3 for installing lofts and cavities roughly double from the levels observed under ECO2t[184].

b. High and low measure costs – the insulation costs are based on the low and high costs provided in the research reports outlined in Annex B (so, for example, the high boiler costs are based on the 'high' boiler cost assumptions provided by the Delta EE report).

c. **High and low search costs –** the high and low search costs are based on the highest (or lowest) search cost reported for each measure, after removing outliers.

d. **High and low administration costs –** the low administration costs are based on annualising the lowest quarterly supplier spend on administration costs observed since January 2016[185]. The high administration costs assume that they revert to their levels seen during ECO2 (April 2015 – March 2017).

[183] https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

[184] This is because the market price for measures installed under the Super Priority Group (SPG) under the Carbon Emissions Reduction Target (i.e. the supplier obligation that ran between 2008 and 2012) roughly doubled over the duration of the SPG obligation. Given that the prices at the end of the SPG were roughly double those at the start, whereas BEIS is assuming the *average* price over the duration of ECO3 is roughly double the market price under ECO2t, this represents a conservative assumption.

[185] https://www.gov.uk/government/statistics/household-energy-efficiency-national-statistics-headline-release-july-2018

Annex D – More Details on the Categories of Costs

Costs Included in the Cost-Benefit Analysis

238. **Installation Costs:** These cover the physical costs of the materials and labour required to install the energy efficiency measure in the home. No reductions are assumed in the real costs of installations over time. In reality, technological improvements and increased competition may lower the costs of installing energy efficiency measures and therefore lower the costs of the policy. Similarly, no costs are assumed to 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[186].

239. **Hidden Costs[187]:** 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, redecoration or disruption costs associated with the installation. These costs are estimated to be small in the majority of cases.

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

241. **Administrative Costs:** In delivering their ECO3 obligation, suppliers will incur administrative costs. These will vary by supplier, depending on their setup[188], but include items such as the cost of running IT databases, staff time 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.

242. Administration costs, as reported by suppliers, are around £85m per annum under ECO2 scheme. These costs are estimated by BEIS to fall under ECO3 to around £55m per year, as outlined in Section 9, above.

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

244. **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. Boiler replacements made by households, rather than through policy intervention, are referred to as 'natural replacements'. These replacements will be sourced and funded by individual households, which are likely to be costlier 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.

245. 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.

[186] As all prices are in real 2017 prices, they are implicitly assumed to rise with inflation.
[187] 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
[188] For example, some suppliers may have their own installation arms, which may increase the administration costs the supplier directly incurs.

Costs Included in the Distributional Analysis

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

Consumer Bill Impacts

247. Suppliers are assumed to pass the costs of delivering their obligation on to all their customers through the variable element of their 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 cause a supplier to lose customers and potentially have a detrimental impact on its market share.

Annex E - More Details on the Categories of Benefits

Benefits Included in the Cost-Benefit Analysis

248. An overview of the monetised benefits included in the analysis is detailed below, all of which are valued in line with the Green Book and supplementary guidance on valuing changes in energy and greenhouse gas emissions[189].

249. **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 to provide electricity).

250. **Air Quality Improvements and Carbon Savings:** Similarly, lower energy use improves air quality and reduces carbon emissions[190]. 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.

251. **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

252. **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 accounting for the distribution of energy bill savings, the benefit to low income households can be valued more highly than had the benefit accrued higher-income households. This effect can be valued using equity-weighting.[191]

253. **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 using equity-weighting.

254. **Wider Benefits:** There are also likely to be a range of benefits associated with improved health outcomes[192], potentially savings for health service provision, and improvements in productivity that it has not been possible to monetise.

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[189] See: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254083/2013_main_appraisal_guidance.pdf.

[190] 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

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

[192] Estimates of the monetised health impact for households of energy efficiency measures are included in Section 9.8; however, the overlaps with comfort taking are at present unclear, therefore these benefits are not included in the cost-benefit analysis, to avoid double-counting.

Annex F – Further Modelling outputs

255. This section summarises the projected delivery of measures during ECO3 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 the ECO regulations neither control nor regulate for this.

256. There is considerable uncertainty about what the actual distribution of measures will be, in part because it is not known whether historic delivery 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.

Tenure

257. The majority (around 58%) of measure uptake is estimated to be in the owner-occupied sector (which also represents the largest tenure group of the housing stock), with a further third of measures installed in the private rental sector.

258. Delivery to privately rented homes is disproportionately high given the sector makes up around 20% of the stock[193]. 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.

259. Finally, the distribution also reflects the focus of Affordable Warmth, where social housing is restricted to only the least efficient properties, and therefore the bulk of delivery must occur in private tenure housing.

Table 29: Estimated Uptake of Measures by Housing Tenure (October 2018 – March 2022)

Housing Tenure	
Owner-occupied	58%
Rented (private)	34%
Rented (social)	8%

Fuel Type

260. Table 30 shows that nearly a fifth of delivery is estimated to be to households heated by non-gas fuels, in line with the GB average (around 18% of households are heated using non-gas fuels, including electricity[194]).

261. For Affordable Warmth suppliers have an additional incentive to deliver to non-gas fuelled households, as suppliers receive an uplift for delivering insulation measures to non-gas fuelled households. These uplifts are in place because fuel poor households disproportionately use non-gas fuels to heat their homes[195]. Balancing 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.

[193] https://www.gov.uk/government/statistics/english-housing-survey-2016-to-2017-headline-report
[194] See for example the Table 11B of the Fuel Poverty Statistics https://www.gov.uk/government/collections/fuel-poverty-statistics, which shows that 15% of homes in England are heated by fuels other than gas.
[195] The percentage of households that are fuel poor is around 19% for electrically heated homes, and 12% for other fuel types. This compares to 10% for gas heated homes. See Table 11b of the 2018 Fuel Poverty Statistics https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018

Table 30: Estimated Uptake of Measures by Heating Fuel (October 2018 – March 2022)

Main Heating Fuel	
Gas	83%
Electricity	14%
Oil	2%
Solid	1%

Domestic Gas Grid

262. The vast majority of delivery (83%) is estimated to be to households on the domestic gas grid, nearly in line with the GB average. As above, the slight skew in delivery to off-gas grid properties under Affordable Warmth reflects the Department's assumption there are stronger incentives to deliver to non-gas fuelled properties due to the uplift scores available for these properties (this offsets the additional search costs for finding eligible off gas homes. See Annex B for assumed search costs).

Table 31: Estimated Uptake of Measures by Whether on the Gas Grid (October 2018 – March 2022)

Connected to gas grid	
Connected to gas grid	83%
Not connected to gas grid	17%

Dwelling Type

263. About 45% of measures are predicted to be delivered to larger properties (detached and semi-detached). Again, this reflects our assumption that suppliers target the most cost-effective homes in delivering their obligations.

Table 32: Estimated Uptake of Measures by Dwelling Type (October 2018 – March 2022)

Dwelling type	
Detached	18%
Semi Detached	27%
End Terrace	10%
Mid Terrace	21%
Bungalow	6%
Flat	18%

Rurality

264. Around 17% of delivery (over 200,000 measures) is projected to be to rural households, meaning delivery to rural areas will exceed the scheme's 15% rural sub-obligation.[196] 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.

Table 33: Estimated Uptake of Measures by Rurality (October 2018 – March 2022)

Rural status	
Rural	17%
Urban	83%

[196] 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. A slightly different definition applies in Scotland.

Annex G – Non-Monetised Impacts

265. There are a significant number of benefits that have not been monetised, due to the limited scope in the modelling of the scheme, which focuses on setting the obligation size for energy suppliers. These non-monetised benefits include:

- **Lower Energy Imports:** reducing the amount of energy inputs required from overseas, reducing the country's reliance on imports and improving security of supply.
- **Lower Costs of Meeting Peak Energy Demand**: increasing energy efficiency reduces the amount of peak energy demand, particularly from electrically heated homes. This reduces the amount of capacity to be built or to reinforce the grid.
- **Health Impacts**: although not included in the headline NPVs, there are likely to be additional health benefits associated with improving the energy efficiency (and warmth) of a home.
- **Increase in Innovation (up to 10% of the Obligation can be delivered through Innovation):** the scheme can support business activity, particularly in sectors with large potential for growth through innovation, delivering potential cost reductions in the future.
- **Wider Economic Benefits**: the scheme will continue to support the energy efficiency supply chain and, in tandem with its impact on innovation, promote growth in jobs in the sector.
- **Community Impacts and Flexible Eligibility**: improving the well-being of low income, vulnerable and fuel poor households will improve the communities of those amongst which they live. Also, measures such as solid wall insulation often helps to regenerate an area, increasing further the wellbeing of those living there. local authorities' ability to access ECO through Flexible Eligibility funds could better enable the scheme to be targeted at areas that benefit from these measures the most.

Annex H – Costs and Benefits of ECO

266. This section of the IA outlines the key costs and benefits of ECO since its introduction in January 2013. Some totals may be slightly different from their constituent parts due to rounding.

Households Treated

267. Between January 2013 and April 2018, 1,842,112 unique properties have received a measure under ECO, constituting around 7% of the GB housing stock[197].

Chart 3: Tenure of Household Treated Under ECO (Jan 2013 – March 2018)

268. The chart above shows the breakdown of homes treated by tenure. To date, owner occupier properties are more likely to be treated under ECO, with private and social rented properties under represented (given their share of the overall housing stock).

269. The underrepresentation of social housing partly reflects that socially rented properties were not eligible under Affordable Warmth prior to April 2017 (and limited to those with an EPC Band rating of E, F or G since), reflecting that the energy efficiency of social housing is generally better than private tenure households.

270. The exclusion of social housing for most of the duration of Affordable Warmth, and targeting of fuel poor households under this element of the scheme, means that private rented housing has been overrepresented[198] within Affordable Warmth specifically, with around 26% of measures being delivered to this tenure (compared to around 20% of the GB housing stock being within this tenure in 2016). This stands in contrast to the scheme overall, as discussed above.

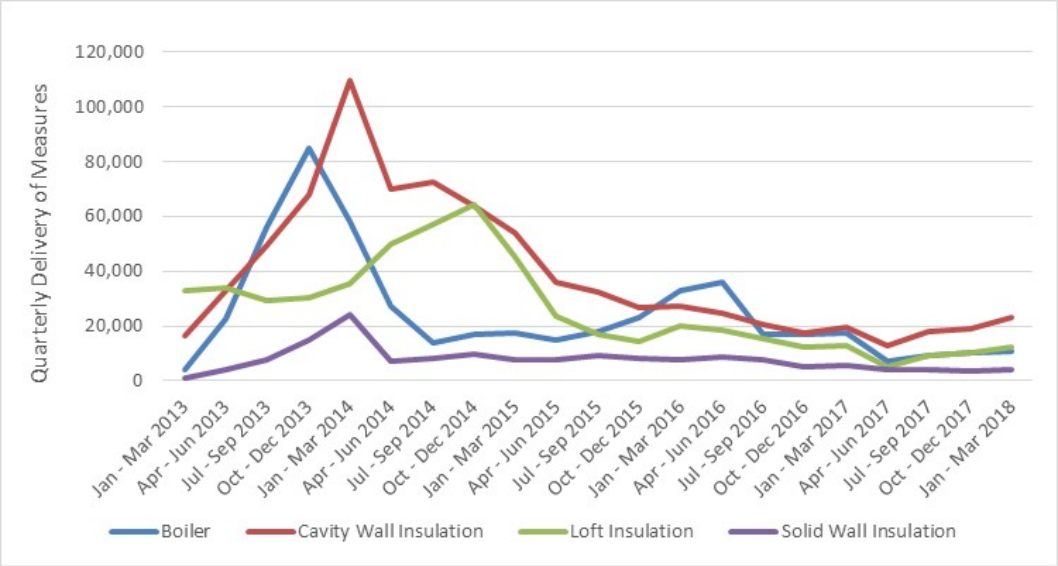
Measures Delivered

271. Between January 2013 and April 2018, 2,321,680 measures have been installed under ECO. The most frequently installed measure has been cavity wall insulation (35.4% of the total), followed by loft insulation (23.7%) and boilers (22.2%). Around 165,000 solid walls have been insulated under ECO, around 7% of the total measures delivered, but 2% of the remaining uninsulated solid walls at the start of 2013.

272. The delivery of the most frequently installed measure is shown in the chart below.

[197] https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections
[198] Households in the private rented sector are the most likely to be in fuel poverty in 2016. See https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018

Chart 4 – Delivery of Major ECO Measures by Quarter (Jan 2013 – March 2018)



273. The spike in delivery during 2013 partly reflected the slow start to the scheme at the start of that year, reflecting, in part, that the scheme was of a different design to its predecessors, the Carbon Emissions Reduction Target (CERT) and Communities Energy Saving Programme (CESP), so some time was need for familiarisation[199]. However, it also reflected changes to the scheme that were announced in late 2013, which meant that any hard to treat cavities and solid wall insulation installed under CERO prior to April 2014 received an uplift of 1.75 to their scores once suppliers had delivered more than 35% of their obligation.

274. The drop in the number of measures delivered after this and particularly after April 2015 (the start of ECO2), partly reflected the lower level of supplier send required in order to meet their ECO2 targets (around £820m per year, in 2013 prices, compared to £1.3bn at the start of ECO), and partly reflected that suppliers had significantly over delivered against their ECO1 obligations[200]. This meant that suppliers had to deliver fewer measures under ECO2 (and, subsequently, ECO2t) than had they not over delivered during ECO1.

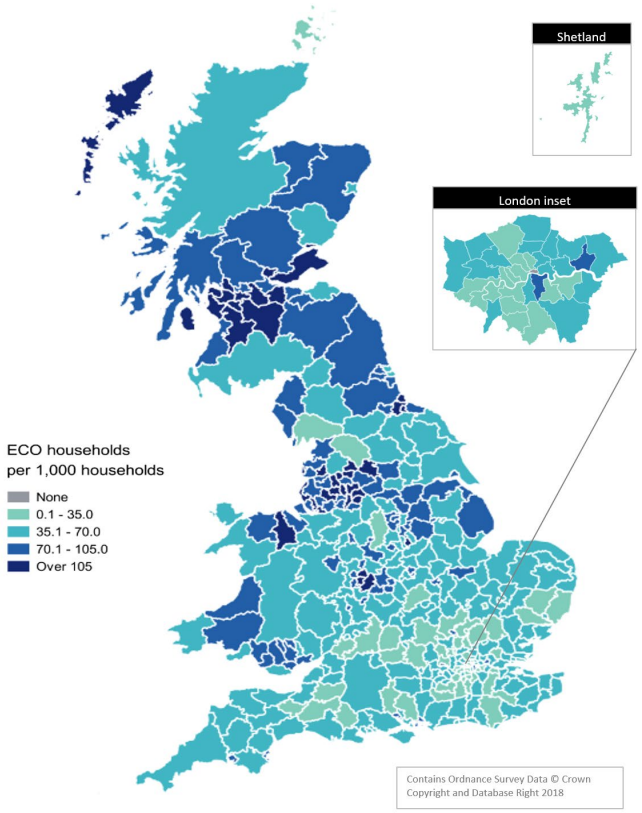
Delivery by Region

275. The graphic below shows the delivery of ECO measures by local authority. The region with the highest number of measures installed per 1,000 inhabitants was the North West, followed by Yorkshire and the Humber, and the North East. The regions least likely to see ECO measures installed are London, the South East, and the East.

276. In terms of breakdown by country, England receives around 82% of ECO measures (England represents around 86% of the GB housing stock), Scotland receives around 12% of measures, slightly more than their proportion of the housing stock (9%), while Wales receives around 5% of measures (Welsh houses represent around 5% of GB housing stock).

[199] As outlined in Section 4, this was the one the key rationales for having the transition period between ECO2 and ECO3.
[200] According to the Ofgem ECO1 final report (https://www.ofgem.gov.uk/publications-and-updates/energy-companies-obligation-eco1-final-report) suppliers had delivered 131% of their CERO target, 145% of their Carbon Savings Communities Obligation (CSCO) target and 123% of their Affordable Warmth obligation by the end of March 2015. Suppliers could count over delivery against the targets that were set under ECO2.

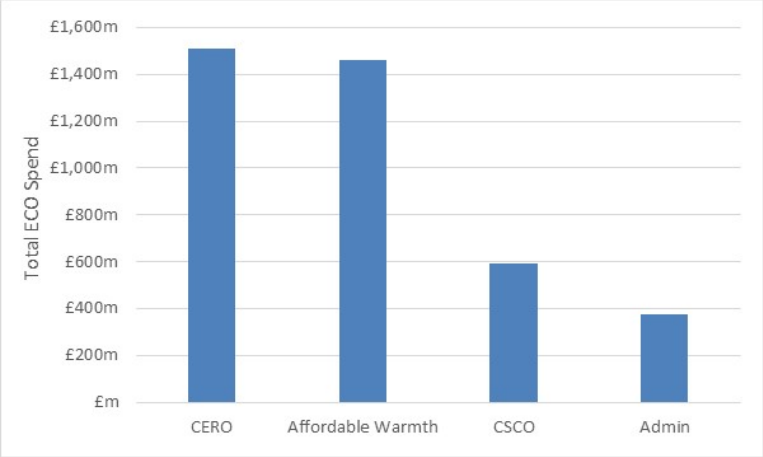
Graphic 1: ECO Measure Delivery by Local Authority (Jan 2013 – March 2018)



Supplier Spend

277. Between January 2013 and March 2018, suppliers spent a total of £3,937m on delivering their ECO obligations. The breakdown of spend is shown in Chart 5 below.

Chart 5: Tenure of Household Treated Under ECO (Jan 2013 – March 2018)



278. The chart shows that the most expensive component of ECO was the CERO obligation at just over £1.4bn (38%) of total spend; suppliers have also spent just over £1.4bn (37%) in meeting their Affordable Warmth obligations, while they spent around £600m (15%) in meeting their CSCO obligations, which ended at the end of ECO2 (March 2017). Finally, scheme administration comprised around £400m (10%) of the total spend.

Monitoring and Evaluation

279. The Department has a range of data sources through which to monitor and evaluate delivery during ECO3. These are discussed, in turn, below:

280. **Household Energy Efficiency National Statistics**[201]: this monthly publication presents a detailed breakdown of delivery against ECO[202]. At present, the statistics report (amongst other things):

    a. Monthly number of measures and homes treated
    b. Volume of each measure installed (by quarter)
    c. Delivery by region (by quarter)
    d. Delivery by property type, and tenure (by quarter)
    e. Delivery by main fuel type (by quarter)
    f. Quarterly aggregate supplier costs (delivery costs by obligation and aggregate supplier administration)
    g. Cumulative carbon and energy savings from measures installed
    h. Highest and lowest average delivery costs (anonymised) between January 2013 and March 2017 (ECO1 and ECO2) and from April 2017 (ECO2t)

    Most statistics are reported around 2 months after the measures have been installed[203].

    Detailed reports are also produced annually towards the end of March.

281. **Supply Chain Survey:** BEIS contacts around 200 different installers, managing agents, energy suppliers and local authorities on a quarterly basis, asking them to fill out a survey detailing the source of funding for measures installed (for example, how much is paid for by the energy supplier, the household, local authorities, and so on). It also requests information on the search costs of finding eligible households. More detail on the survey can be found in Annex B.

282. **National Energy Efficiency Data-Framework (NEED)**[204]**:** this database allows the Department to monitor the in-situ performance of measures installed under ECO, compared to a control group of 'similar' households. Through this, the Department can monitor the energy savings of measures installed each year. NEED forms the basis of the energy savings underpinning this IA. The database has a time lag of between 1.5 and 2.5 years (depending on when the measure was installed).

283. **Progress against targets**[205]**:** Ofgem publish monthly progress for each energy supplier against each of their obligations, which are usually for measures notified to Ofgem two months prior (so, for example, measures notified in July would be reported in September).

284. **Technical Monitoring:** suppliers are required to get an independent party to verify that a subset of the measures have been installed to the correct standard. More information on technical monitoring can be found in Annex M.

285. **Stakeholder engagement:** BEIS will discuss progress with stakeholders (such as the obligated energy suppliers) over the course of ECO3.

[201] https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics
[202] The figures discussed in this Annex are based on these statistics.
[203] Some metrics, such as aggregate supplier costs in delivering ECO are reported quarterly, and therefore have a slightly longer lag. For example, delivery costs incurred between July and September 2018 will be reported in December 2018.
[204] https://www.gov.uk/government/collections/national-energy-efficiency-data-need-framework
[205] https://www.ofgem.gov.uk/environmental-programmes/eco/contacts-guidance-and-resources/eco-public-reports-and-data/scheme

286. **In situ monitoring**[206]: suppliers will be able to carry out In-situ performance monitoring of measures for up to 10% of their (non-innovation) obligation. If the measures prove to perform better than the deemed scores, suppliers will receive any additional savings towards their obligation. The monitoring equipment and methodology will be subject to an application process to ensure accuracy. Data from in situ monitoring will complement those reported under NEED (outlined above).

287. The Department also intends to carry out a formal evaluation of ECO in due course.

[206] See the consultation response for more information https://www.gov.uk/government/consultations/energy-company-obligation-eco3-2018-to-2022

Annex I – Local Authority Flexible Eligibility

288. Under ECO2t, suppliers were able to meet up to 10% of their obligations through Local Authority Flexible Eligibility. LA Flexible Eligibility was introduced in April 2017, as a voluntary element of the scheme that enables suppliers to work alongside participating Local Authorities.

289. Under Flexible Eligibility, a participating local authority is able to: (a) determine its own locally specific criteria for identifying private tenure households that it considers to be living in fuel poverty or on a low income and vulnerable to the effects of living in a cold home (hence the term 'Flexible Eligibility') and (b) determine non-fuel poor households as eligible for solid wall insulation exclusively where this forms part of a project that delivers solid wall insulation to fuel poor or low income and vulnerable households. All other scheme requirements (e.g. measure type, maximums, administrative processes) apply in the same way as under the rest of the scheme.

290. Since its introduction, an increased number of measures have been delivered under this route. In March 2018, for example, 5% of delivery was delivered under this route, constituting over a thousand measures in this month alone. Total delivery to March 2018 is shown in Table 34 below.

Table 34: Measures Delivered Under Flexible Eligibility April 2017 to March 2018

Measure	Volume
Boilers	1,121
Cavity Wall Insulation	564
Loft Insulation	592
Electric Storage Heaters	97
Heating Controls	252
Flat Roof Insulation	12
Underfloor Insulation	82
Solid Wall Insulation	282
Total	**3,002**
Number of Properties Treated	**2,424**

Source: BEIS Household Energy Efficiency National Statistics[207]

291. As Flexible Eligibility is relatively new, BEIS has comparatively little evidence on how it affects the costs of suppliers in meeting their obligation. However, since it is optional, and suppliers will only use it where it is cost effective to do so, Flexible Eligibility is expected to reduce the costs to suppliers of meeting their obligation.

292. BEIS has, however, attempted to quantify the impact of Flexible Eligibility through two routes:

a. **Reducing Supplier Search Costs.** If Local Authorities identify low income, vulnerable and fuel poor 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.

   BEIS asked stakeholders to provide their search costs under Flexible Eligibility through its supply chain survey (see Annex B). However, while the Department was able to update its search costs for the scheme overall, Flexible Eligibility search costs specifically were not forthcoming. One reason for this is that at the time of the survey, Flexible Eligibility had only been running for a few months.

b. **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.

[207] https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

293. BEIS looked to estimate the increase in pool size by applying the following methodology:

- Examining the eligibility criteria outlined in all local authority Statements of Intent, and ranking these from those that applied the most stringent eligibility criteria to those with the least. The eligibility criteria for median Local Authority was then selected and used to represent the 'typical' eligibility criteria that might be applied across all Local Authorities.
- An assumption was made on the number of local authorities that might participate in Flexible Eligibility (BEIS assumed 50% of local authorities would participate, based on the level of interest shown by local authorities during ECO2t[208]).
- The eligibility is applied to the English Housing Survey, in the same way as it is used to determine the 6.6m eligible pool (described in Annex B).

294. Applying this methodology suggested that Flexible Eligibility might increase the pool size by some 500,000 homes, taking the total pool size to 7.1m homes. This larger pool size underpinned the estimates set out in Sections 9 and 10 in the main body of the IA.

295. The Department believes that this is a conservative estimate as there was no way to robustly identify those households that local authorities deemed vulnerable to the effects of cold home, meaning many of these households may have been excluded.

296. This increase in the eligible pool has been incorporated into the modelling. Therefore, while the Department is not able to identify the impact of Flexible Eligibility on scheme search costs, it has increased the eligible pool to reflect Flexible Eligibility, meaning more cost-effective homes can be found each year within the Affordable Warmth model. This increases the assumed number of measures that suppliers can treat within the £640m per year spend envelope.

297. Other ways that Flexible Eligibility might reduce a suppliers' delivery costs (but which the Department was not able to quantify) include:

1. **Realising Economies of Scale.** Flexible Eligibility will allow suppliers to treat multiple neighbouring homes with solid wall insulation, even if only some of them receive relevant benefits (for example, Universal Credit).

2. **Reducing Compliance Costs**. Suppliers won't need to check eligibility with the Department of Work and Pensions, helping to reduce bureaucracy.

[208] Nearly 50% of Local Authorities have already issued statements of intent. More are expected to participate when Flexible Eligibility is increased from 10% under ECO2t to 25% under ECO3, so BEIS' assumption is a conservative one.

Annex J - Innovation

Uptake of Innovation – Evidence from CERT

298. The Carbon Emission Reduction Target (CERT, a predecessor obligation to ECO, which ran between 2008 and 2012) allowed suppliers to deliver part of their obligation through innovation (up to a 10% cap). The Demonstration Actions and Market Transformation routes under CERT operated in a similar way to the demonstration actions and innovation score uplifts under ECO3, described in Section 5, above.

299. Suppliers met nearly 10% (9.6%) of their CERT obligation – almost exclusively through Market Transformation. Far less of the obligation was met through Demonstration Actions, with just 0.1% of the CERT targets delivered through this route. One reason for the lower uptake of Demonstration Actions, which was targeted at measures that didn't have pre-determined deemed score under CERT, was the higher risk associated with promoting and installing measures through this route.

Potential Impact of Innovation on the Market for Energy Efficiency

300. Promotion of measures through the two innovation routes (Demonstration Actions and Innovation Score Uplifts) is intended to have one or more of the following benefits:
    - the development and deployment of new measures that are not currently delivered under ECO and therefore do not have a deemed score;
    - reductions in the costs of improving solid walled homes, recognising there can be trade-offs between the costs of the works and the levels of carbon savings achieved;
    - devices and controls that improve consumers' ability to manage their energy use;
    - improvements in the processes of production and installation of measures that bring down costs and allow new ways of solving problems; and
    - better ways of identifying and targeting households for ECO support that result in an improved customer experience.

301. Innovation is also expected to generate wider benefits – such as knowledge spillovers, whereby innovation undertaken as part of ECO increases the amount of innovation being carried out elsewhere in the industry.

302. Stakeholders (including obligated energy suppliers) supported the introduction of innovation under ECO3. As obligated suppliers expressed an interest in delivering measures under Innovation, and the 10% CERT innovation cap was broadly met, BEIS has assumed that suppliers will use the innovation routes and has increased the ECO3 targets to account for the uplifts that suppliers will receive from using this route. This increases the overall ECO target by 5%.

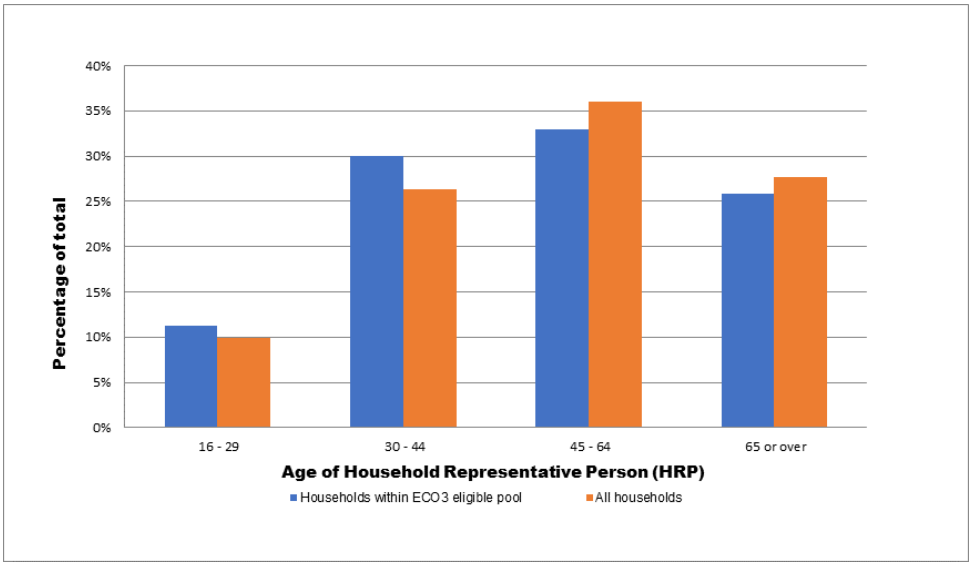
Annex K – Equality Impact

303. The impact of ECO3 on the protected characteristics covered in the Equality Act 2010 are expected to be similar to those presented in the 2014 ECO IA[209], but are discussed briefly below. Where a particular protected characteristic is not listed, it is because there is no evidence that people with this protected characteristic are more or less likely to benefit from, or lose out because of, the policy.

Age

304. The age profile (based on the Household Reference Person[210]) of households eligible for ECO3, compared to the general population, is shown below. It suggests households under 45 are slightly more likely to be eligible, while those over 45 are slightly less likely to be eligible for ECO3, although the difference only varies by a few percentage points within each age group, suggesting no group is significantly under or over represented under ECO3.

Chart 6: Age of Households Eligible for ECO3 Compared to the General Population



Disability

305. ECO3 extends eligible benefits to those in receipt of a wide range of disability benefits[211] so people with disabilities are expected to be more likely than the average household to benefit from ECO3.

Race

306. In England, households where the Household Reference Person is from an ethnic minority are more likely to be in fuel poverty[212] during 2016. However, BEIS does not have any evidence on whether they are more or less likely to be eligible, or benefit, from ECO3.

Pregnancy and Maternity

209 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/373650/ECO_IA_with_SoS_e-sigf_v2.pdf (page 45)

210 The Household Reference Person is the individual interviewed as part of the English Housing Survey (this survey underpins the Affordable Warmth modelling, as outlined in Annex C).

211 Disability Living Allowance, Personal Independence Payment Attendance Allowance, Carer's Allowance, Severe Disablement Allowance, Industrial Injuries Disablement Benefits, War Pensions Mobility Supplement, Constant Attendance Allowance, Armed Forces Independence Payment

212 https://www.gov.uk/government/statistics/fuel-poverty-detailed-tables-2018 (Table 22)

307. ECO3 is expected to have a positive impact on low income households that have recently had children as they will be eligible under the scheme as are in receipt of Child Benefit (below an income threshold) or Child Tax Credit.

Impact of Energy Efficiency Improvements on Rents

308. Improving the energy efficiency of a property within the private rented sector could, in theory, allow a landlord to increase the rent they charge tenants, offsetting some of the benefits (e.g. lower energy bills) that would otherwise accrue to the tenant.

309. In a market exhibiting the features of perfect competition, a reduction in the running costs of a property (due to improvements in its energy efficiency) could cause a demand shift towards these properties. This demand shift could allow the landlord to increase the rent they change for these properties at the expense of those that are less efficient, as the market becomes differentiated according to properties' energy occupancy cost.

310. In practice, however, landlords may be unable to increase their rents significantly in response to energy efficiency improvements under ECO. For one, the 7% of domestic PRS landlords[213] affected by this proposal may struggle to remain competitive if they sought to recover costs by raising rents significantly above the average rate for their local market. Analysis by the Ministry of Housing, Communities and Local Government suggests that rental levels are more likely to be affected by changes which affect a greater proportion of the market, such as changes to mortgage rates[214].

311. Furthermore, as outlined in Section 3, customers have incomplete information on the benefits of energy efficiency improvements and tend to undervalue them[215], suggesting the demand shift is likely to be small in practice, limiting the ability of the landlord to increase rents. For example, the forthcoming hedonic price study[216] did not find a statistically significant relationship between EPC Band ratings and rent below EPC Band D (although it did find that properties with an EPC Band rating of C commanded a higher rent than those with an EPC Band rating of D).

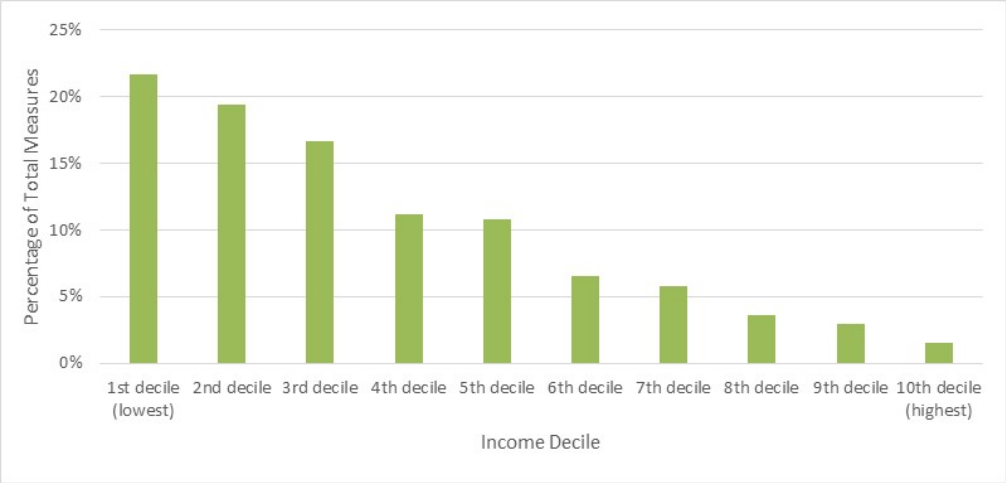
Distribution of ECO Measures by Income Decile

312. The chart below shows the distribution of measures installed by the income of the recipient household (after removing household costs and adjusting the number of members of that household). It shows that measure delivery is skewed towards the lower end of the income distribution with around 60% of measures going to households in the bottom three income deciles.

313. ECO is expected to be funded by suppliers passing on the costs they incur onto their consumers. Broadly speaking we would expect these costs to be borne equally across all income deciles.

[213] Around 7% of the private rented sector are estimated to make improvements under ECO3. According to the 2010 MHCLG landlords survey (see https://www.gov.uk/government/statistics/private-landlords-survey-2010) , the vast majority of landlords own just one property, meaning a similar number of landlords as PRS properties will be affected.
[214] As outlined in the 2017 PRS IA
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/669214/PRS_Consultation_stage_IA.pdf
[215] https://www.gov.uk/government/publications/energy-efficiency-opportunities-in-the-uk
[216] A study that looks to isolate the increase in the price impacts (house prices or rents) of improving the energy efficiency of the property by controlling for all other factors that might influence such prices (such as property location, size etc).

Chart 7: Measures delivered by after-housing-costs equivalised income decile



Annex L – Health Impacts of Domestic Energy Efficiency Model (HIDEEM)

314. BEIS has collaborated with a team of leading experts from University College London and London School of Hygiene and Tropical Medicine to develop a model to estimate the change in occupants' health from the installation of energy efficiency measures (resulting from changes in the indoor temperature and pollutant exposure). The model that was developed is the HIDEEM model.

315. HIDEEM uses the English Housing Survey as a basis for the analysis. The model is built from a number of inter-related modules covering a building's permeability properties and individual health conditions. Pollutants included in the model that impact on health are: particulate matter, tobacco smoke, radon gas and mould growth. The health conditions linked to these pollutants include heart and circulatory diseases, cancers and strokes, as well as respiratory illness and common mental disorders. HIDEEM uses the Quality Adjusted Life Year (QALY) method to monetise these health impacts. This involves placing a value on the change in a person's health over time.

316. More details on HIDEEM can be found in Section 6 of the analytical annex to Fuel Poverty: A *Framework For Future Action*[217].

[217] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211137/fuel_poverty_strategic_framework_analytical_annex.pdf

Annex M – Quality and Standards

Each Home Counts Quality Mark

317. In July 2015, the Government commissioned Dr Peter Bonfield, Chief Executive of the Building Research Establishment, to lead an independent review of consumer advice, protection, standards and enforcement for UK home energy efficiency and renewable energy measures.

318. The Each Home Counts (EHC) Review findings were published in December 2016 and proposed that existing standards and quality assurance schemes be brought together under a single, recognisable brand including the introduction of a quality mark for the sector.

319. The development and implementation of the quality mark aims to avoid duplication and unnecessary bureaucracy, by working within existing schemes to build on good practice, and therefore reduce additional costs for industry and consumers.

320. The intention is that businesses registered with the quality mark through its scheme providers will be regularly monitored and audited for adherence to those standards. The Government will retain a level of influence through endorsing the quality scheme and standards and utilising a master licence agreement.

321. The quality mark aims to achieve a range of objectives[218].Those most relevant to the ECO scheme are to provide:
    - a reputable product and services to consumers through a holistic approach to all overarching standards and enforcement requirements included in the quality mark;
    - a consistent and fair redress process including a single point of contact for consumers with the capability to support vulnerable consumers, an agreed standard for complaint handling, and access to alternative dispute resolution;
    - a minimum set of requirements for Codes of Conduct and Codes of Practice for all organisations that wish to gain the quality mark, including agreed requirements on technical standards, sales practices, pre-contractual information, and requirements for appropriate financial protections for installations;

322. The Government decided that ECO3 will not initially include the quality mark, however has been clear that the policy intent is to include at a later date. The technical monitoring arrangements for ECO3 will continue to require all solid wall, cavity wall, and park home insulations are accompanied by the relevant guarantees so that the measure is awarded the standard applicable lifetime. The Administrator must be satisfied any guarantee meets the criteria as set out under the scheme regulations.

323. Once the EHC quality mark is fully developed, BEIS will assess when it will become part of the scheme; this will include transitional arrangements for installers to become compliant.

Publicly Available Specification (PAS)

324. The Publicly Available Specification (PAS) is a specification for the installation of energy efficiency measures in existing buildings which is developed by the British Standards Institution (BSI). The primary objective of PAS is the provision of a robust, uniformly applicable specification that will assist installers that comply with its requirements in full, to demonstrate that their installation processes are capable of providing the installation of energy efficiency improvement measures to specification and in accordance with the customer's expectations and needs. The current scheme requires ECO measures that are referenced in PAS to be installed in accordance with PAS 2030:2017 and for the installers delivering these measures to have a PAS 2030 certification.

[218] For more information about the Each Home Counts quality mark see: https://nb158.infusionsoft.com/app/page/ehc-download-page-1

325. The Each Home Counts review identified the need for further work on standards for the energy retrofit of buildings to provide for the end to end delivery of retrofit measures.

326. As a result, a new PAS 2035 specification for the energy retrofits of domestic buildings will be produced during 2018 to include requirements for building assessment and measure design, installation, commissioning, and handover. This will replace parts of the current PAS 2030, and in particular, will include the new design clauses that industry has recognised as more relevant to the Energy Efficiency Measures (EEM) design community rather than installers.

327. PAS 2030 will also be revised and simplified during 2018 to remove the transferred design elements and move away from reliance on the common minimum technical competence (CMTC), focusing on industry approved minimum qualifications or apprenticeships together with industry-approved Accreditation of Prior Experience and Learning (APEL) procedures, for installers with previous training and experience.

328. Responses to the ECO3 consultation supported that ECO measures referenced in PAS 2030 and PAS 2035 should be installed in accordance with PAS 2035 and the latest version of the PAS 2030. Consultees also responded that installers delivering measures referenced in PAS 2030 and PAS 2035 should be certified against PAS 2035 and the latest version of PAS 2030.

Technical Monitoring

329. Under ECO suppliers are required to conduct technical monitoring inspections on a sample of their ECO measures[219] to ensure the required standards of installation are met. Technical monitoring inspections should take place at one of two installation stages:

- Mid-installation inspection: This inspection is only required for certain measures (solid wall insulation, flat roof, party wall, room in roof, and under floor insulation). Where a finishing layer e.g. render is applied to a measure, these inspections should take place after the insulation has been fitted but before the finishing layer has been applied.

- Post-installation inspection.

330. Technical monitoring agents will assess whether measures are being installed in accordance with the relevant version of PAS (see above).

331. If a measure fails monitoring, this suggests that the measure has not been installed in accordance with the relevant standards of installation for that measure and Ofgem will not attribute the measure's LBS savings unless the supplier is able to demonstrate that the measure is generating savings and/or that it has been scored correctly.

332. When a supplier has reported that a subset of measures has either not achieved the monitoring required, or has exceeded the trigger fail rate of 10%, it must undertake additional actions to provide us with confidence in the quality and/or accuracy of this subset of measures. When this happens, we say that this subset of measures has been placed on a 'pathway to compliance'.

333. More information on technical monitoring can be found in the latest ECO guidance[220]. Technical monitoring reports can be found on the Ofgem website[221].

[219] 5% monitoring per measure type, and 3% monitoring per installer.
[220] https://www.ofgem.gov.uk/publications-and-updates/energy-company-obligation-2017-18-ECO2t-guidance-delivery
[221] https://www.ofgem.gov.uk/environmental-programmes/eco/contacts-guidance-and-resources/eco-public-reports-and-data/scheme

Annex N - Justice Impact

334. 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 sought a court order – although the latter has not occurred under supplier obligations since they began in the 1990s.