Cadent

Your Gas Network

How to pay for energy policy

The options for allocating costs

Executive Summary

Context and Introduction

Amidst the turmoil in global energy markets and its dramatic effect on household bills, the government continues to develop its plans for delivering net zero by 2050. There is a question over how the energy policies that achieve these aims are paid for. Today these costs are largely met through electricity bills, and there is debate over the extent to which this supports or hinders efforts to decarbonise.

Several commentators on the energy sector have called for energy policy costs to be shifted from electricity to gas consumers to reduce electricity bills and make the adoption of heat pumps for home heating more affordable. While this may sound appealing from the point of view of encouraging people to uptake low emission options like heat pumps, the consequences of such changes are significant, particularly for those less well-off and for those where an electrical heating solution is still uneconomical. There are also significant impacts from spreading these increasing costs over a declining customer base, resulting in higher bills as the burden of this and the ongoing costs of running the gas network too falls on fewer and fewer people.

These impacts need to be well understood before policy decisions are made that impact directly on consumers' pockets. This report therefore explores in some detail the impact of a range of different options for recovering policy costs and illustrates how they could evolve over time as the use of energy changes.

Under the current charging regime, policy costs charges on bills are expected to be £215 for an average home by 2025. In all the scenarios assessed, these are expected to increase significantly over the coming decades. Recovering policy costs via energy bills has two major impacts that need to be considered. First, it risks distorting consumer decisions on the adoption of new technologies such as heat pumps. Second, it is likely to be increasingly regressive as it disproportionately impacts low-income households.

There is a strong argument these costs are social ones that are therefore best recovered through general taxation. This of course, however, is not straightforward given the government's fiscal position, and if this is not possible therefore, government should continue to assess the most appropriate allocation of policy costs between consumers and between fuels.

Key findings from our analysis

For each of the three options we have considered, we assess the impact of changing the allocation of energy policy costs on electricity and gas bills. Our analysis is based on the Climate Change Committee's (CCC's) Balanced Pathway:

Option 1 — The current approach. The government currently allocates policy costs to the fuel supported by each individual policy or scheme. By 2035, this approach would mean a consumer using electricity only would pay £291/year more in energy policy costs than a consumer on dual fuel (£756 versus £465). Early adopters of heat pumps would be particularly hard-hit, facing higher policy costs than gas users despite having a lower carbon impact.

Option 2 — A shift of policy costs to gas. The government could shift the majority of policy costs to gas bills to incentivise a more rapid transition to heat pumps. While superficially attractive, such an approach would significantly penalise the remaining users of the gas network – including those for whom a heat pump is either unaffordable or impractical. A household connected to the gas network would find themselves paying over £1045 in energy policy costs alone by 2035, over 22 times as much as a household using a heat pump. This figure rises to more than 100 times by 2050 (or over £4,585/year in energy policy costs) - even though the gas network would be decarbonised by this time.

Option 3 — A proportionate approach. The government could vary the allocation of costs over time in relation to the share of consumers remaining on each network. This would largely eliminate the distortions discussed above whilst still making heat pumps cheaper to run than gas boilers. Households left connected to the gas network would still pay policy costs twice as high as heat pump households in later years (£574 compared to £243 in 2050).

Without a solution using general taxation, a proportionate approach therefore looks like the best solution to adopt. If policy costs remain a material component of energy bills, the government would, however, also need to consider putting in place significant direct protection for low-income households, particularly because low-income households tend to be less able to access low-carbon technologies like heat pumps.

Introduction

Current arrangements

Over the last ten years there has been a trend to fund a growing burden of energy and social policy schemes through energy bills. The different types of energy policy costs that are added to bills is shown in Table 1. More recently, there has been significant price volatility caused by the fall-out from the covid pandemic and the Ukraine war. By 2025 we expect average policy cost charges on energy bills to be £215 for an average dual fuel home (Figure 1), around 17% of the total annual bill.

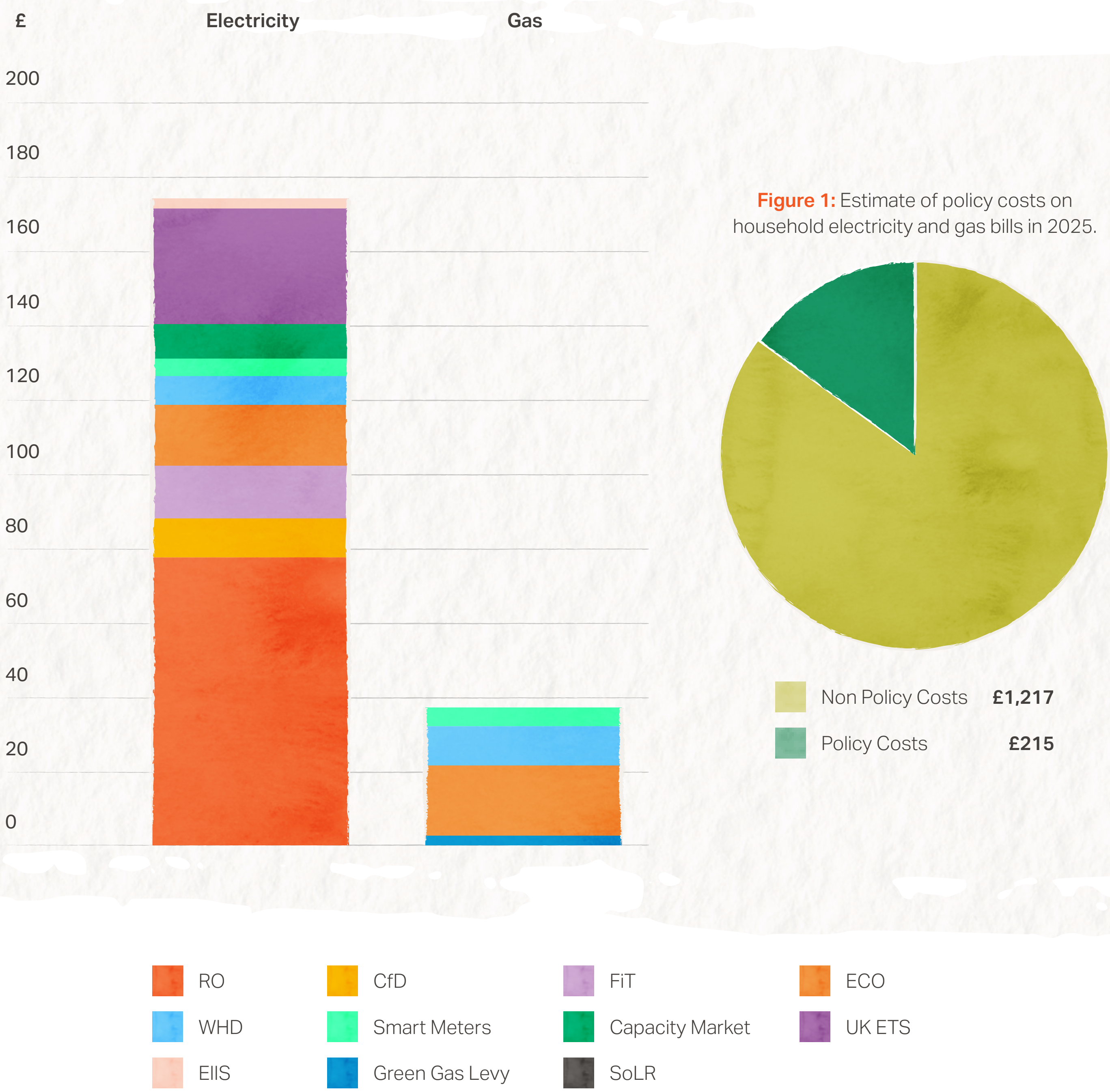


Figure 1: Estimate of policy costs on household electricity and gas bills in 2025.

Note: Costs for a benchmark medium sized household,[1] 2023 prices. Detailed modelling assumptions set out in sections below and in the Appendix.

[1] Based on Ofgem's Typical Domestic Consumption values, as per its July 2023 price cap decision; 3.1 MWh electricity and 12 MWh gas.

Table 1: Estimated policy costs levied on energy bills in 2025

Scheme	Recovery[2]	Objective	Direct Beneficiaries	Annual Cost per Household (hh)	
				Electricity	Gas
Renewables Obligation (RO)	Variable charge, domestic and non-domestic	Subsidises low-carbon power plants, built between 2002 and 2017, now closed to new plants	Renewable generators (existing)	**£77**	**n/a**
Contracts for Difference (CfD)	Variable charge, domestic and non-domestic	Offers guaranteed prices for renewable generators commissioned since 2014	Renewable generators (new and existing)	**£10**	**n/a**
Feed-in-Tariff (FiT)	Variable charge, domestic and non-domestic	Subsidises small-scale renewables generators, built between 2010 and 2019, now closed to new plants	Small-scale renewable generators, including households	**£14**	**n/a**
Green Gas Levy	Fixed charge, domestic and non-domestic	Funds production (and injection) of biomethane into the gas network	Producers of green gas	**n/a**	**£3**
Energy Company Obligation (ECO)	Variable charge, domestic only	Funds insulation and energy efficiency measures in low-income homes	Low income, fuel poor and vulnerable households	**£17**	**£19**
Warm Home Discount (WHD)	Fixed charge, domestic only	Lowers electricity bills for low-income households through rebates in winter, with costs passed to other consumers	Low-income households	**£8**	**£10**
Smart Meters	Fixed charge, domestic only	Installation of free (at point of use) smart meters in all GB properties	Households, flexibility providers	**£5**	**£6**
Capacity Market	Variable charge, domestic only	Offers 'availability' payments to non-intermittent generators	Generators (mainly firm power)	**£5**	**n/a**
UK Emissions Trading Scheme (ETS) & Carbon Price Floor (CPS)	Variable charge, domestic and non-domestic	Applies a price to carbon emissions through tradeable permits for industrial and power emissions	Low-carbon generators	**£4**	**n/a**
Supplier of Last Resort (SoLR) Levy	Variable charge, Domestic only	Recovers socialised costs incurred by SoLRs when taking over failed suppliers' consumers (e.g. covering credit balances and procuring wholesale costs)	Consumers of defunct suppliers, companies who act as SoLR	**>£1**	**>£1**
Energy Intensive Industries Scheme (EIIS)	Variable charge, Domestic and non-domestic	Compensates energy-intensive industries that face high costs from UK ETS and CPS	Industry	**£2**	**n/a**
Totals				**£177**	**£38**

As Table 1 shows, policy costs today largely fall on the electricity bill. This largely aligns the costs of energy policies with those who benefit from them and ensures all consumers contribute to them, noting that whilst all households have an electricity connection not all consumers are connected to the gas network.

Whilst the majority of policies are established to support the shift to renewable electricity and the management of such technology, this increases the cost of heating homes with electrical appliances such as heat pumps compared to gas boilers by making electricity more expensive.
This has prompted some to suggest that – given the importance of heat pumps to the decarbonisation of heat - energy policy costs should either be paid for through general taxation or reallocated to the gas bill.

2. "Fixed charges" tend to be recovered via the standing charge (on a £/household basis) whereas "variable charges" tend to increase with energy use (i.e. £/MWh). Levies are either recovered from all energy users (domestic and non-domestic) or from domestic properties only. Some non-domestic users are exempt from levies due to the Energy Intensive Industries Scheme.

Figure 2: Heat pump vs gas boiler running costs at various heat pump performance levels

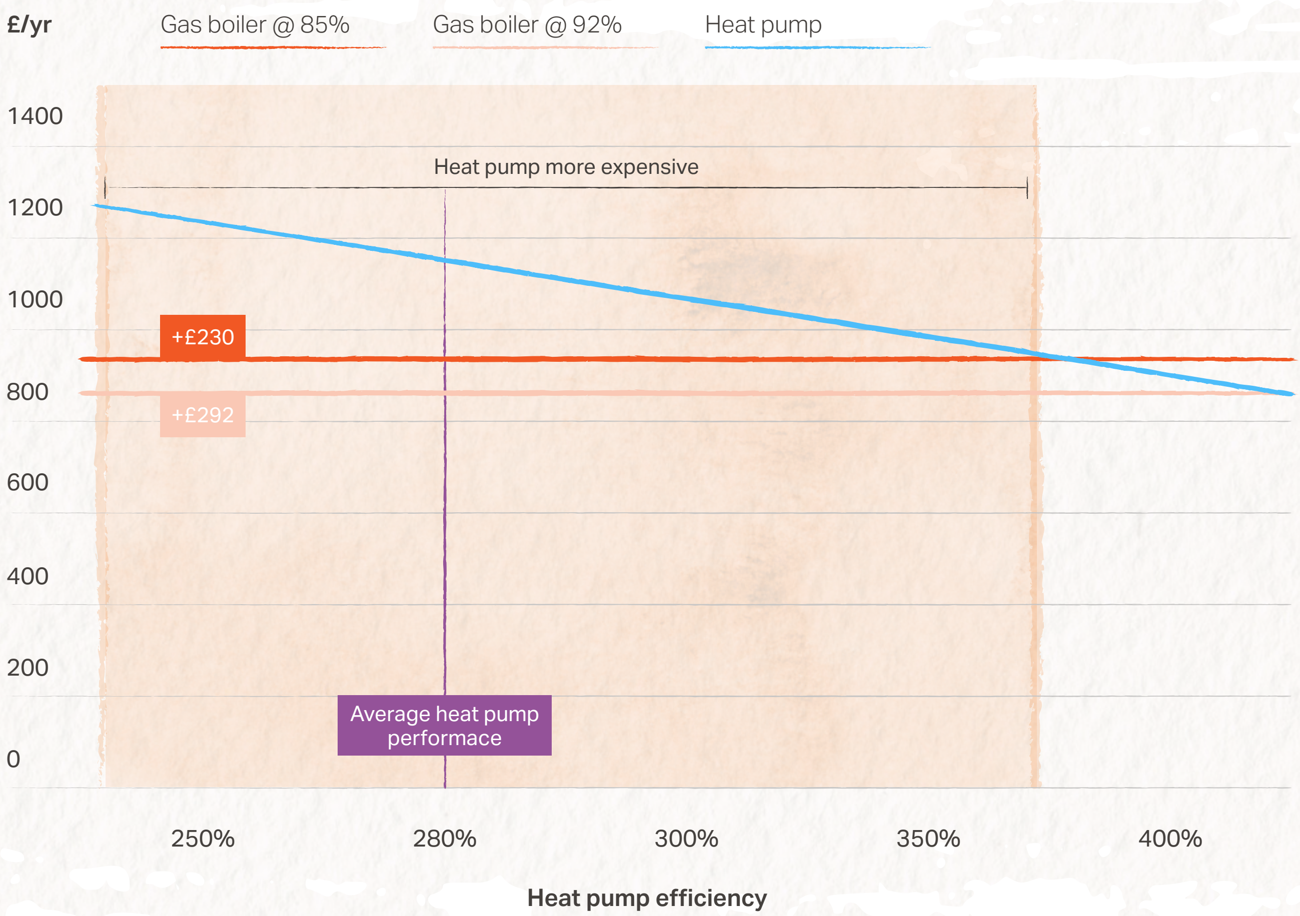


Figure 2 shows the annual running costs of natural gas boilers in comparison to heat pumps depending on the efficiency of the heat pump. Whilst heat pumps can operate at high efficiencies to be competitive with gas boilers today, the average heat pump performance is currently around 280%[3]. As the efficiency of heat pumps increases the less there is a difference in running costs when compared to gas boilers.

This means that an average heat pump installation in an average home could cost between £230 and £292 more to run each year than a gas boiler, depending on the efficiency of that boiler[4]. Given policy costs allocated to the electricity bill are estimated to total £177 in 2025, removing or reallocating some or all policy costs away from the electricity bill would go some or all the way to addressing this difference, reducing some barriers to heat pump uptake.

Reducing the difference between heat pump and gas boiler running costs is not the only consideration here, however. Government must also consider fairness and the need to protect vulnerable consumers. The number of consumers connected to the gas network will reduce over time as more heat pumps are installed, leaving a smaller number of consumers over which to share costs allocated to the gas network.

Given the higher upfront cost of installing heat pumps, it is likely consumers left connected to the gas network will increasingly be from lower-income groups.

Furthermore, government will also be mindful of the need for transparency, with a desire to ensure energy consumers have a clear view of the costs they are paying and a link between the individual and societal benefits received in return.

Given these potentially competing criteria, we have analysed three potential options available for allocating energy policy costs including the current approach, shifting policy costs to the gas bill and allocating policy costs to the bill in proportionate to the number of consumers connected to each network at that time.

[3] Energy Systems Catapult, Electrification of Heat - Interim Heat Pump Performance Data Analysis Report. As these are average year-round efficiency values it is implicit that some heat pumps will already be cheaper to run than a gas boiler today. [4] Range reflects variation in the efficiency of the gas boiler. The Energy-related Products Regulation sets minimum standard for new gas boilers at 92% efficiency. Real-world efficiency performance is however also determined by the system flow temperature and quality of the installation. Real-world gas boiler efficiency levels may be nearer 85% (DECC, "Final Report, In-situ monitoring of efficiencies of condensing boilers and use of secondary heating" 2009).

Approach

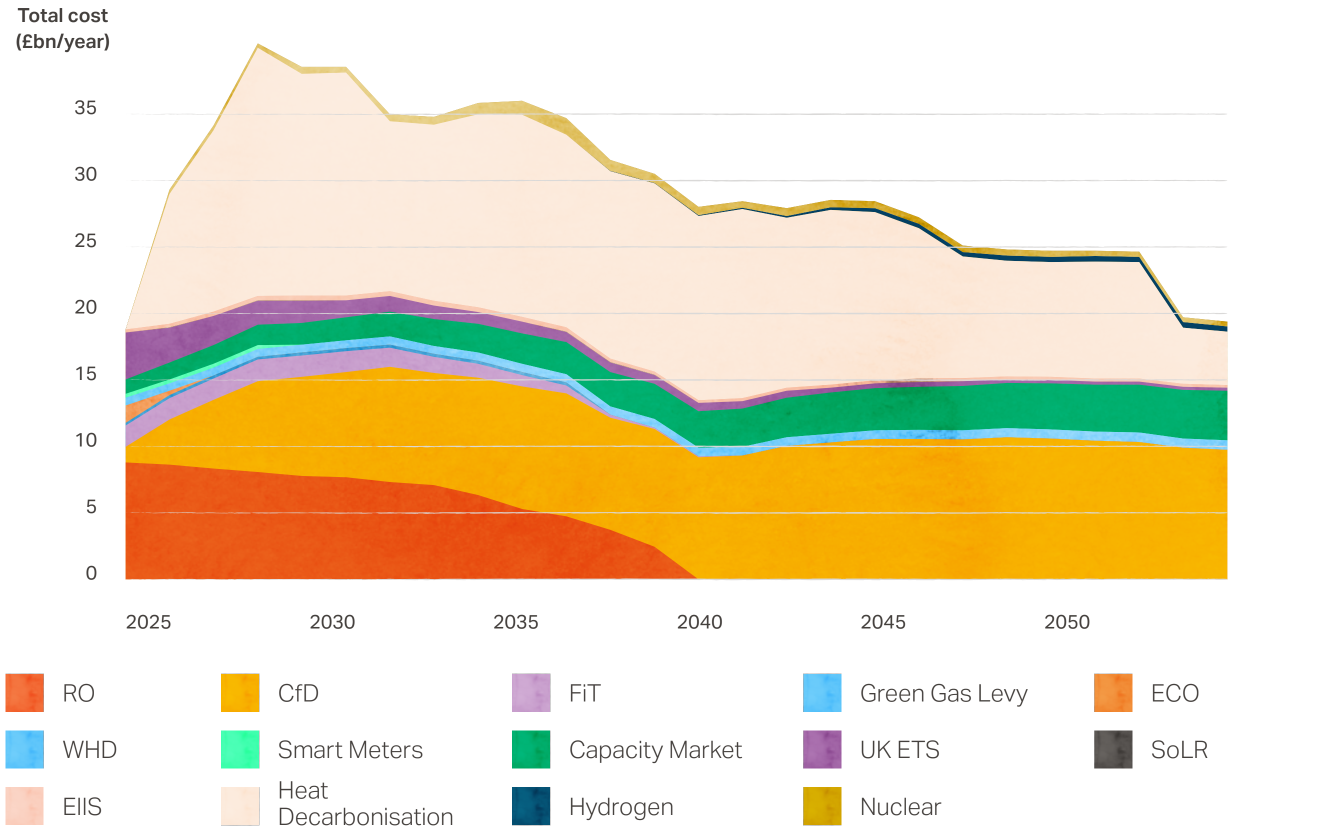
In its Sixth Carbon Budget[5] report the CCC modelled four broad scenarios, or "pathways", for how the UK could reach its 2050 net zero emissions target.

These were based on differing levels of technology innovation and consumer behaviour change. These four scenarios were used to create a 'Balanced Pathway' that accounted for uncertainties in the 2030s and 2040s. For the purposes of this report's analysis, an assessment is made of each allocation approach against the policy costs implied over time by this Balanced Pathway. This Pathway was selected as it shows more clearly the implications of reallocating policy costs to gas bills in a world with declining number of consumers connected to the gas network. It also reflects the recent proposals from the CCC to base their forthcoming Seventh Carbon Budget on the Balanced Pathway only[6]. Full details of the methodology and assumptions used can be found in the Appendix of this report, however the following summarises our approach.

Overall level of policy costs

For the purposes of our analysis, the report assumes the additional costs needed to reach fully decarbonised heat and electricity sectors are ultimately recovered from consumer energy bills, in line with the historic approach from government. This report accounts for policy costs which are directly added to energy bills by suppliers (such as the Contracts for Difference levy) as well as those which are levied indirectly (such as on generators and gas producers and ultimately passed through to consumers as with Carbon Credits). An additional assessment is then made of the scope to recover some or all these costs through general taxation. The costs of decarbonising electricity and heat are material, amounting to an average between 2035 and 2050 of £11bn per year for clean electricity and £8bn per year for clean heat (for example, by installing new heating systems and associated insulation)[7]. Note the analysis in this report does not account for the investment necessary in electricity and gas networks required to accommodate future energy production. These costs are also typically recovered from consumers through the energy bill albeit without being considered as 'policy costs'. Neither does it include any costs associated with decommissioning the gas network or recovering stranded asset costs. These costs could be significant[8], however there is no agreement yet on how or when these costs would be paid for.

Figure 3: Annual cost of schemes funded via electricity and gas bill levies under the CCC's Balanced Pathway[9]



[5] CCC (December 2020), The Sixth Carbon Budget: The UK's path to Net Zero. [6] CCC (November 2023), Proposed methodology for the Seventh Carbon Budget advice. [7] As per the Balanced Pathway. [8] See Arup (for National Infrastructure Commission, October 2023), Future of Great Britain's Gas Networks. [9] Source for chart is analysis of CCC data and others. See Annex for more details.

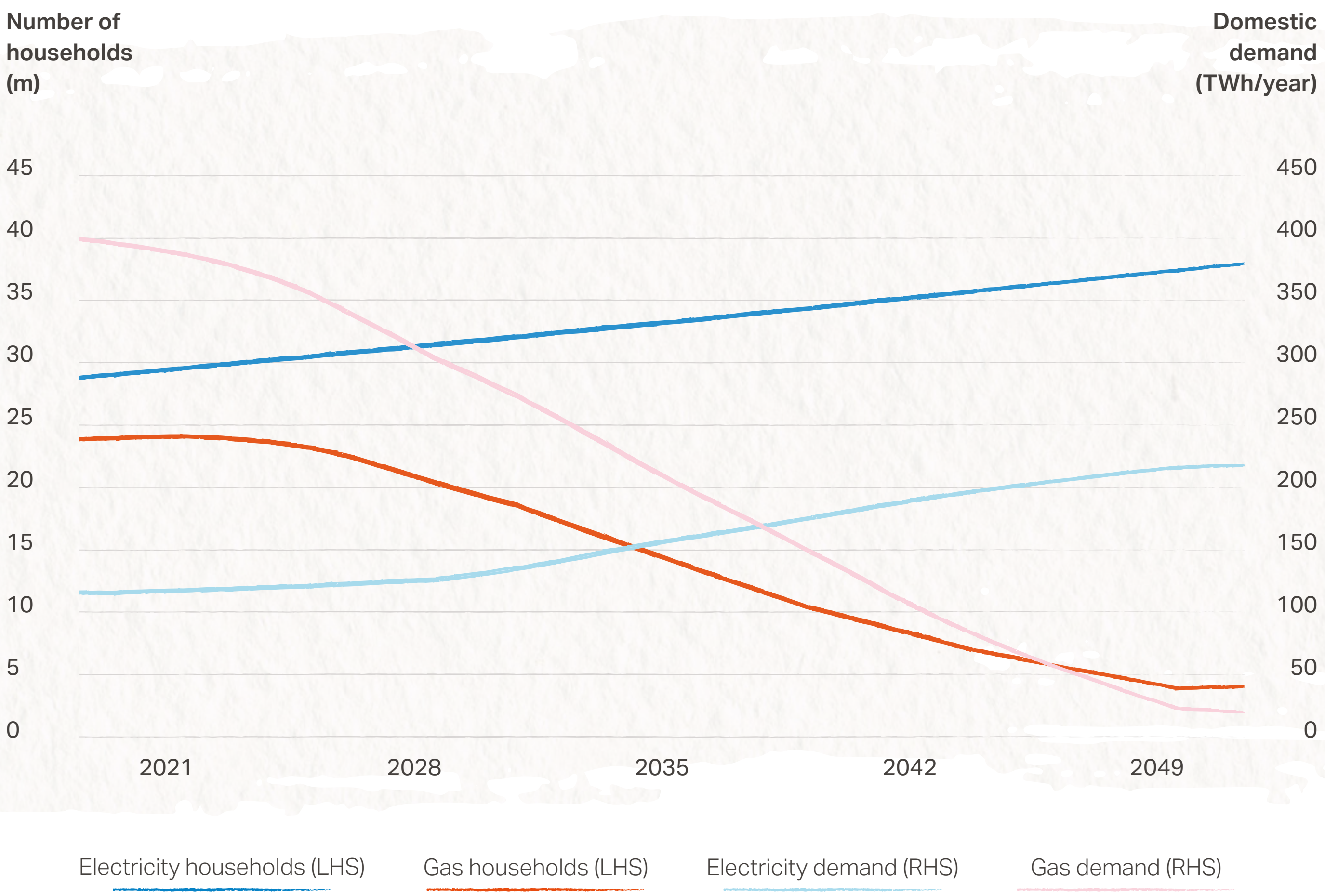
Changes to consumer numbers and demand

Overall policy costs are allocated to gas or electricity bills in our model depending on the allocation approach being tested. The Balanced Pathway assumes the electrification of most, but not all, heat. This means the number of consumers connected to each network changes over time with consequential impacts for the cost of policy costs per consumer. Note that the number of electricity consumers gradually increases over time, from around 28m today to around 38m in 2050, as the UK builds more new homes.

Also note that under the Balanced Pathway some 4.8m homes will retain a connection to the gas network in 2050, largely to provide fuel to hybrid heat pumps. Even in 2050 under the Balanced Pathway there will therefore be a proportion of 'dual fuel' consumers using electricity and some gas.

Furthermore, some policy costs are distributed on a per unit basis, i.e. consumers with higher demand pay more. As average demand levels change over time because homes become more efficient in their use of energy this too has implications for how much individual consumers will pay towards energy policy costs. Both these variables are modelled in this analysis, using data taken from the Sixth Carbon Budget.

Figure 4: Forecast of household numbers and total consumption by households under the CCC's Balanced Pathway[10].



[10] Source for chart is CCC data. Note that for total gas demand and domestic gas demand, our model relies on CCC estimates of natural gas, hydrogen and biofuel. Our model assumes all biofuels represent green gas injected into the gas network, and not other biofuel uses (e.g. off-grid solid fuels).

Reforming policy cost allocation

A principles-led approach

Given the complexity of allocating current and future policy costs, it is important to assess options against a range of criteria. It is particularly important that any change to the existing approach ensures affordability for all energy consumers, including those in fuel poverty, while enabling the deployment of the mix of low-carbon heat technologies needed to achieve net zero.

We therefore propose four, potentially conflicting, principles policy makers should consider when deciding how to allocate policy costs. Firstly, they must consider how best to deliver carbon reduction, with policy costs creating clear incentives to reduce emissions. Costs should therefore reflect the underlying carbon impact of a fuel with the share of costs not increasing as a sector reduces its carbon intensity. Secondly, they should put fairness at their heart, with the beneficiaries of a scheme paying for its cost rather than costs being passed to others who either do not benefit or only receive an indirect benefit. Thirdly, they should ensure policy costs are allocated with transparency, with consumers having a clear view of the costs they are paying if placed on their bills, with a transparent link to the individual and societal benefits they are receiving. Finally, protecting the vulnerable should also be a consideration, avoiding regressive outcomes and minimise the impact on low-income households, including over time, given the risk that higher-income households are able to decarbonise more quickly.

Allocation approaches

To help guide policy makers' thinking this report uses these principles to suggest three different approaches to allocating policy costs, assessing the impacts of each to show the impact on consumers – including those on low incomes. These allocation methodologies illustrate alternative approaches that have been discussed in recent years and should not be viewed as specific recommendations. Instead they are examples of how different approaches to policy cost allocation could impact a range of government objectives. The three allocation approaches modelled are as follows:

Allocation approach	Description
Current	Maintaining today's allocation of policy costs between electricity and gas bills.
Shift to gas	Significantly redistributing costs from electricity to gas, including for those costs that do not relate to greening the gas system.
Proportionate	Allocating most policy costs in proportion to the number of households on each network at that point in time.

The **current** approach has been modelled to provide a baseline against which to compare the other approaches. **Shift to gas** tests whether this approach would support electrification of heat, while at the same time understanding the impacts on those vulnerable to fuel poverty. The **proportionate** approach is modelled to see if the impact of policy costs on some in society can be mitigated while still maintaining strong decarbonisation signals.

We also estimate the extent to which a change in approach would address the difference in running costs between a heat pump and a gas boiler, and therefore the degree to which a change would create further incentives to electrify heat. In calculating the absolute level policy costs would increase to, we are also able to show the impact on bills, and therefore the trade-off for fairness and potentially affordability.

Figure 5: Summary of approach

Main Modelling Results

Current approach: Under this approach, we assume a continuation of the current allocation of most existing costs to electricity bills. We split the assumed future costs of decarbonising heat based on the proportion of low-carbon heating systems installed in homes via either the electricity or gas network, (shared 50:50 for hybrid technologies) and assumed hydrogen production support costs are recovered from gas consumers.

Table 2: Assumed allocation of schemes under current approach

Scheme	Allocation to electricity	Allocation to gas
Renewables Obligation	Full	None
Contracts for Difference	Full	None
Nuclear RAB	Full	None
Feed in Tariffs	Full	None
Green Gas Levy	None	Full
Energy Company Obligation	Shared c. 50:50	Shared c. 50:50
Warm Home Discount	Shared c. 50:50	Shared c. 50:50
Smart Meter Programme	Shared c. 50:50	Shared c. 50:50
Capacity Market	Full	None
UK ETS Carbon Credits	Full	None
SoLR Levy	Shared c. 50:50	Shared c. 50:50
Energy Intensive Industries Scheme	Full	None
Heat Decarbonisation Costs	Shared, in proportion to the mix of technologies installed on electricity	Shared, in proportion to the mix of technologies installed on gas
Hydrogen Production Support	None	Full

As with other allocation approaches modelled, the results presented are for the 'average household', with consumption over time adjusted in line with average domestic gas and electricity consumption from the Balanced Pathway[11].

What follows is an assessment of the mean average policy costs incurred by the average household. The energy policy costs incurred by an individual household will vary based on (i) whether they are connected to only the electricity network or both electricity and gas networks; and (ii) their main source of heating, and therefore whether most demand falls on electricity or gas. Where a household is given as dual fuel, it is assumed their main source of heating is provided by gas – either methane or hydrogen.

Table 3: Policy cost allocation under current approach[12]

	Avg policy costs for an electricity only household (£/household/year)	Avg policy costs for a dual fuel household (£/household/year)	Avg policy costs for dual fuel consumers as a percentage of annual energy bill	Avg policy costs for dual fuel consumers as a percentage of annual household income[13]
2025	£337	£215	15%	0.6%
2035	£756	£465	33%	1.2%
2050	£244	£471	27%	0.6%

We find that total policy costs under the Balanced Pathway increases as a proportion of the energy bill compared to today. This reflects both the rise in policy costs required to achieve net zero, but also that bills overall are forecast to decline in real terms, due to lower wholesale costs and increased energy efficiency.

Maintaining the status quo leads to a significant increase in policy costs on bills for electricity only households through the 2020s and early 2030s, before beginning to decline from around 2035 through to 2050 as required investment in electrification begins to reduce. Policy costs for dual fuel households would increase over time, primarily driven by new support for heat decarbonisation and hydrogen production.

Importantly, these increasing costs would be recovered from the ever-declining number of households connected to the gas network meaning the burden on a per consumer basis increases still further over time.

The analysis also suggests that the current approach will tend to increase disincentives to switch from gas heating to heat pumps, as the burden of policy costs paid through electricity bills increases to the mid-2030's. As shown by Figures 6 and 7, it may cost between £364 and £409 per year more to run a heat pump than a gas boiler by 2035. By 2050, the situation would reverse, with heat pumps costing between £170 and £211 a year less to run than a gas boiler.

[11] This report relies on Ofgem's Typical Domestic Consumption values for a medium sized household, as per its July 2023 price cap decision; 3.1 MWh electricity and 12 MWh gas. This 2021 value has been indexed by the CCC's estimate of the change in average household consumption in each pathway. [12] All costs reported in 2023 prices, for a benchmark medium-sized household using gas and electricity. Unless otherwise stated, this paper reports costs for a medium-sized household, based on Ofgem's Typical Domestic Consumption values, as per its July 2023 price cap decision; 3.1 MWh electricity and 12 MWh gas. For subsequent years, assumed benchmark energy consumption changes over time in line with the rest of the country by indexing the 2021 value to the CCC's estimate of the change in average household consumption. Median household is income calculated based on ONS estimates of median income, indexed by GDP growth forecasts. Energy bill based on BEIS forecast of per-unit household electricity and gas prices and consumption assumptions set out above. Electricity only households assumed to use a heat pump. Heat pump performance assumptions are described in the Appendix, but are aligned to CCC Sixth Carbon Budget assumptions. Assumes we follow CCC's Balanced Pathway, as set out in Sixth Carbon Budget. [13] ONS Median household disposable income in 2022 was £32,300.

Figure 6: Policy cost impact under 'current allocation' approach

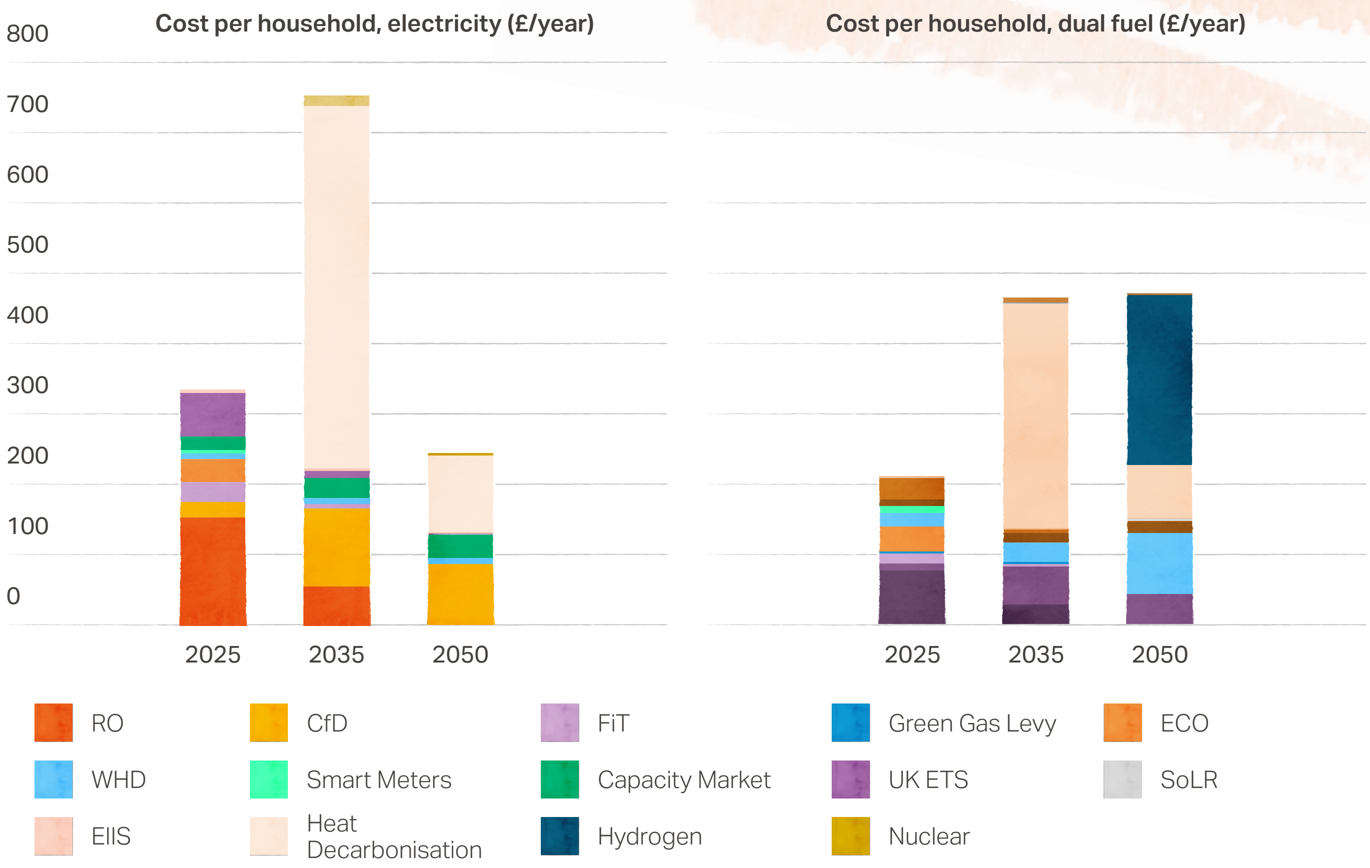


Figure 7: Heat pump vs gas boiler running costs at various performance levels over time under 'current allocation' approach

Shift to gas

Using this approach, policy costs are largely redistributed from electricity bills to gas bills. This means the costs of schemes related to the decarbonisation of the electricity sector and the installation of electric heating technologies are incurred by those left connected to the gas network at any time. Where costs are currently recovered on a unit (per kWh) basis from electricity consumers it is assumed they are recovered on a unit basis from gas consumers – and similarly if they were originally recovered on a per-household basis. This is regardless of whether an individual household's gas consumption is correlated with their electricity consumption.

Table 4: Assumed allocation of schemes under shift to gas approach

Scheme	Allocation to electricity	Allocation to gas
Renewables Obligation	None	Full
Contracts for Difference	None	Full
Nuclear RAB	None	Full
Feed in Tariffs	None	Full
Green Gas Levy	None	Full
Energy Company Obligation	Shared c. 50:50	Shared c. 50:50
Warm Home Discount	Shared c. 50:50	Shared c. 50:50
Smart Meter Programme	Shared c. 50:50	Shared c. 50:50
Capacity Market	Full	None
UK ETS Carbon Credits	Full	None
SoLR Levy	Shared c. 50:50	Shared c. 50:50
Energy Intensive Industries Scheme	None	Full
Heat Decarbonisation Costs	None	Full
Hydrogen Production Support	None	Full

Table 5: Policy cost impact under 'shift to gas' approach [14.]

	Avg policy costs for an electricity only household (£/household/year)	Avg policy costs for a dual fuel household (£/household/year)	Avg policy costs for dual fuel consumers as a percentage of annual energy bill	Avg policy costs for dual fuel consumers as a percentage of annual household income
2025	£95	£236	15%	0.6%
2035	£47	£1045	47%	2.1%
2050	£44	£4585	62%	2.4%

This approach means costs for a household connected to the gas network increase significantly - and stay higher for longer. Furthermore, as more consumers electrify their heat demand total costs are recovered from a falling proportion of households. This means the cost per household of energy policies remaining connected to the gas network reaches £4,585 a year by 2050 under the Balanced Pathway – before other energy costs such as consumption is paid for.

This is over one hundred times the cost an electricity-only household would pay in the same year (£44) towards energy policy costs, despite both households using low carbon energy.

It follows that a 'shift to gas' approach would create material incentives for consumers to install heat pumps, with gas consumers paying between £879 and £924 a year more in running costs than a heat pump consumer by 2035. By 2050 gas consumers would be paying between £4,483 and £4,524 a year more in running costs.

Given the relatively high upfront capital costs of heat pumps, such a shift to gas approach creates the risk that those who can afford to 'opt-out' of policy costs install a heat pump, avoiding the high energy policy costs allocated to gas consumers, and leaving those less well-off to pay for the delivery of energy policy. This creates questions of fairness and equity. It also raises a question of whether net zero is deliverable under such an allocation of costs. For example, it is likely consumers may demand a change to either the system of distributing costs or the energy policies themselves before they reached the level of £4,585 per year per gas consumer. It is also worth noting that by 2050 any consumer remaining connected to the gas network will be using low carbon gases, such as hydrogen. Penalising them for this would neither be fair nor acceptable.

Finally, this approach could potentially create an outcome where electricity consumers are not paying for the infrastructure they are directly benefitting from, highlighting a further fairness challenge of such an approach. For example, costs related to the provision of support for new nuclear power, intended to reduce the cost of electricity over the long run, would be funded by gas consumers.

For simplicity, the modelling assumes a transfer of costs to gas immediately, rather than a phased approach. In practice, the government would likely implement any reform of this kind in a gradual way, for example phased in over a ten-year period.

[14.] All costs reported in 2023 prices, for a benchmark medium-sized household using gas and electricity

Figure 8: Policy cost impact under 'shift to gas' approach

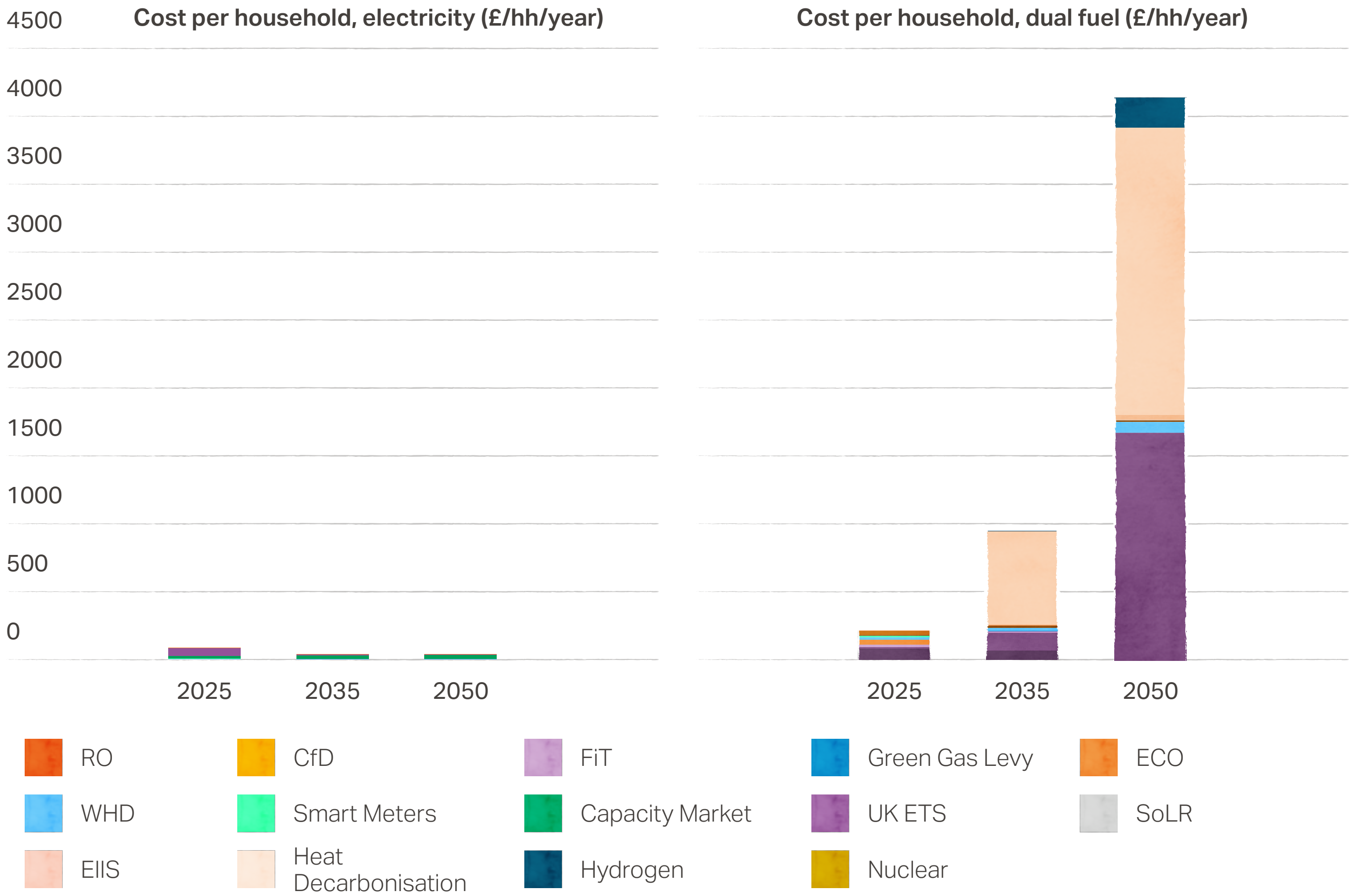


Figure 9: Heat pump vs gas boiler running costs at various performance levels over time under 'shift to gas' approach

Proportionate

Under this approach, policy costs are split proportionally between electricity and gas bills based on the number of households connected to each network. This would mean approximately 45% of policy costs are paid for through the gas bill today, reflecting the fact that not all homes are connected to the gas network. This would then change over time as the number of homes connected to the gas network falls. For the purposes of this report, under the proportionate approach, we assume the share of costs allocated to gas and electricity bills is updated annually based on the actual numbers of consumers connected to each network at that time[15].

Our analysis also assumes Capacity Market and ETS costs continue to be levied only on electricity bills. Capacity Market costs specifically deliver electricity-system requirements, meaning they are best linked to electricity bills, whereas the ETS is intended to provide a price signal on electricity generators which would be broken if costs were recovered from gas consumers.

Table 6: Assumed allocation of schemes under 'proportionate' approach

Scheme	Allocation to electricity	Allocation to gas
Renewables Obligation	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Contracts for Difference	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Nuclear RAB	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Feed in Tariffs	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Green Gas Levy	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Energy Company Obligation	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Warm Home Discount	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Smart Meter Programme	Allocated in proportion to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Capacity Market	Full	None
UK ETS Carbon Credits	Full	None
SoLR Levy	Allocated in proportionate to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Energy Intensive Industries Scheme	Allocated in proportionate to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Heat Decarbonisation Costs	Allocated in proportionate to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	
Hydrogen Production Support	Allocated in proportionate to the number of connections on the gas and electricity network over time. The split is approximately equal in 2020s, but increasingly falls on electricity as households disconnect from the gas network over time.	

[15] In practice, this allocation approach would require the government to allocate policy costs between electricity and gas based on the expected share of consumers using the gas network – updated over time to reflect the latest estimates.

Table 7: Policy cost impact under 'proportionate' approach[16].

	Avg policy costs for an electricity only household (£/year)	Avg policy costs for a dual fuel household (£/year)	Avg policy costs for dual fuel consumers as a percentage of annual energy bill	Avg policy costs for dual fuel consumers as a percentage of annual household income
2025	£249	£218	15%	0.6%
2035	£572	£611	38%	1.4%
2050	£243	£574	27%	0.5%

This approach means energy policy costs would be gradually re-allocated to electricity bills over time as the number of properties connected to the gas network declines. This avoids adding significant costs onto the decreasing number of households who remain on the gas network, even once it has fully decarbonised. As a result, a more balanced approach to policy cost allocation occurs over time, particularly during the latter end of the period as the proportion of consumers on each fuel changes more significantly.

This approach also removes any existing disincentive to electrify heat by making a gas boiler more expensive to run, whilst avoiding the extreme running cost penalties for those left connected to the gas network a shift to gas approach entails. Indeed, with this policy change, at average year-round performance a heat pump would be between £139 and £20 a year more expensive to run than a gas boiler today. That value decreases to between £35 and £80 a year in 2035 and before falling further to represent a saving in running costs of between £274 and £315 in 2050.

16. All costs reported in 2023 prices, for a benchmark medium-sized household using gas and electricity.

Figure 10: Policy cost impact under 'current allocation' approach

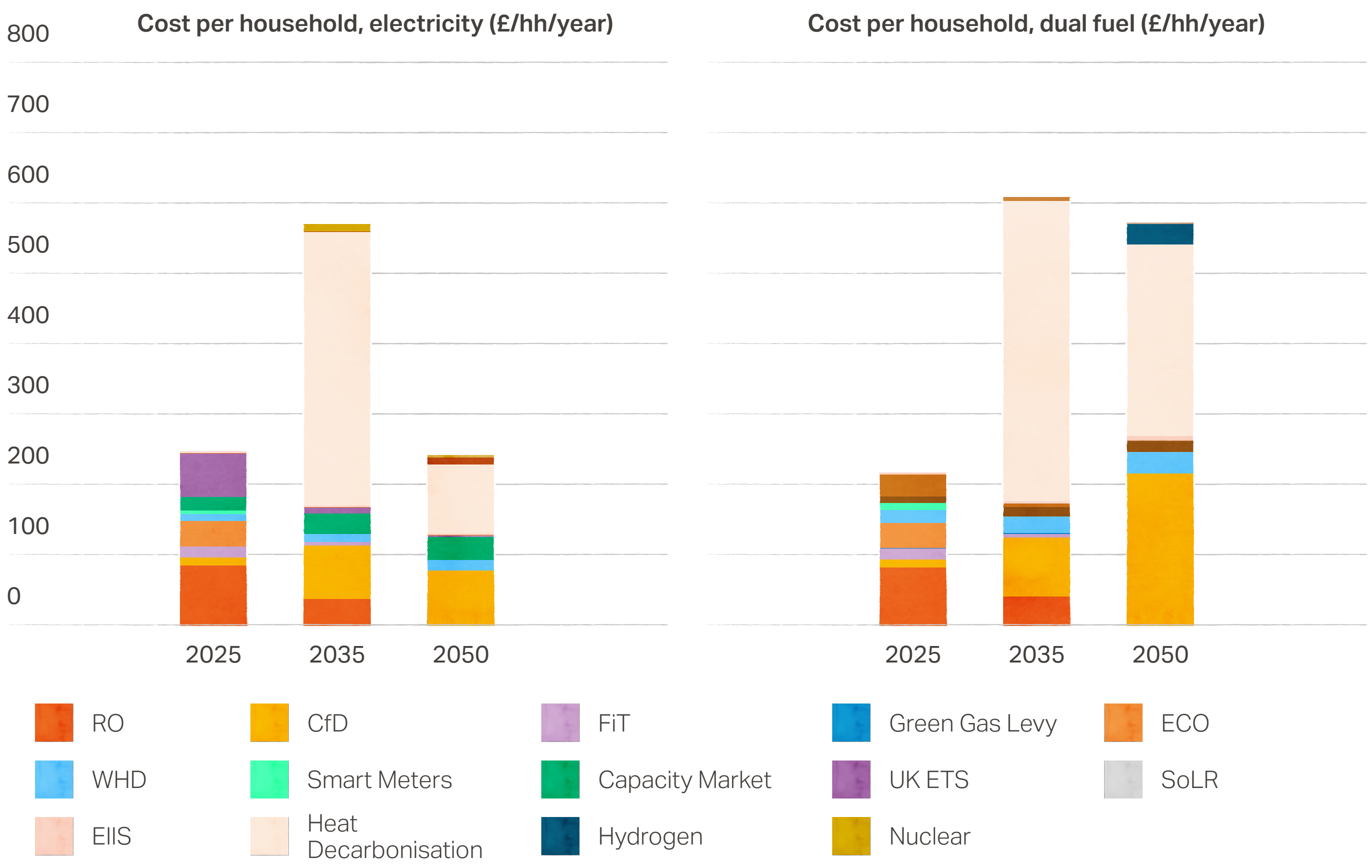
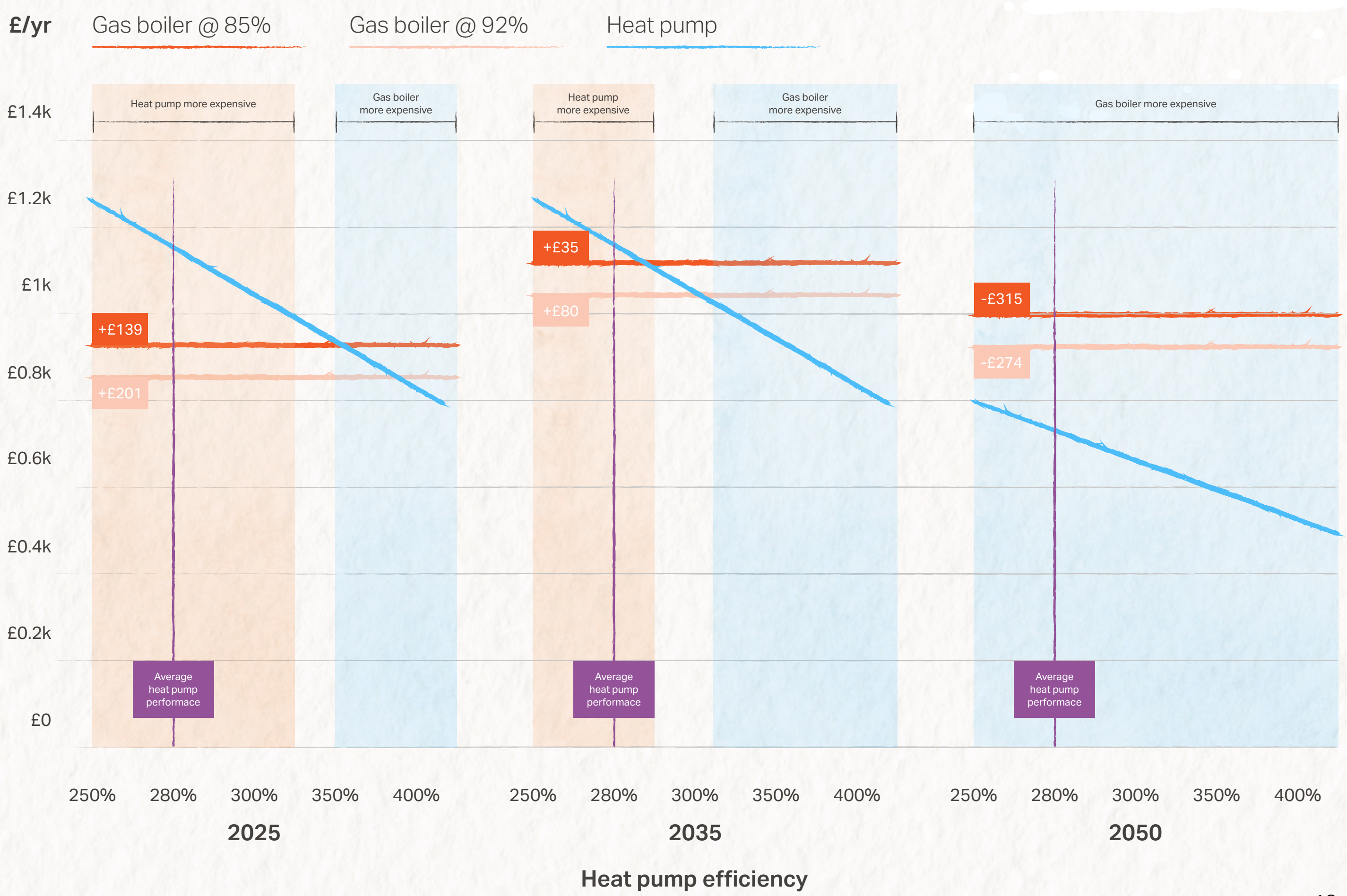


Figure 11: Heat pump vs gas boiler running costs at various performance levels over time under 'proportionate' approach



Assessing outcomes

Assessment

When compared against the assessment criteria of carbon reduction, fairness, transparency, and protecting the vulnerable we find that the proportionate approach is the most favourable.

Importantly, the idea of paying energy policy costs through general taxation is not included below, despite it enabling costs to be distributed by income through the taxation system as opposed to largely by energy consumption through the energy bill. Whilst paying through the energy bill better aligns the costs and benefits of energy policy, energy is an essential good and where consumption is a poor proxy for ability to pay. We therefore argue the best approach would be to pay for all energy policy costs through general taxation.

Removing a proportion of energy policy costs from bills and paying for them through general taxation would provide benefits to consumers, most visible on electricity bills, helping to strengthen the incentives to switch to electric heating by reducing running costs and freeing up household capital to invest in new heating systems and retrofit measures. Whilst cheaper energy overall could reduce the signals to invest in energy efficiency measures, this approach would be significantly fairer as a greater proportion of the costs of achieving net zero would be paid for by households with higher incomes. Whilst the transparency of who is paying what towards net zero would be reduced, it would particularly protect the most vulnerable from potentially large increases in their energy bills.

We recognise this would likely require an increase in taxation if additional fiscal stress was to be avoided at what is an already a difficult time. This is unlikely to be politically and perhaps socially acceptable, particularly close to a general election. We have therefore not included this option in our assessment and instead focus on allocation options which distribute the costs of energy policy between energy bill payers in different ways.

Assessment against the principles: RAG rating description

- [Red] The approach performs poorly against the principle
- [Amber] The impact of the approach is less clearly determined
- [Green] The approach performs well against the principle

	Carbon reduction	Fairness	Transparency	Protecting the vulnerable
Current	[Red] Creates disincentives to install heat pumps in the near to medium term, harming efforts to reduce emissions from heat. There is less of an incentive to reduce gas use for heating by installing energy efficiency measures due to long pay-back times.	[Amber] Rising policy costs on electricity fail to reflect rate of decarbonisation in the power sector. In 2035 policy costs for an electricity only consumer are £756, while for a dual fuel consumer they are £465 per year – reducing by 2050. Lower costs on gas prior to gas network decarbonisation means that the 'polluter pays' signal is lost.	[Green] There is a direct link between source of scheme and those who pay policy costs, particularly for low-carbon electricity. Future heating costs are linked to fuel use.	[Amber] Rising policy costs put pressure on low-income households using electricity. The analysis also suggests growing policy costs could push additional households into fuel poverty. Lower costs on gas are initially positive for fuel-poor households, but this will shift as/if fuel-poor homes begin the switch to electric heating.
Shift to gas	[Amber] Placing additional costs on gas will remove running cost barriers to the installation of heat pumps and energy efficiency improvements in the short-term. In the longer-term, this could weaken incentives to use hydrogen for heating, as the policy cost burden increases further. This could reduce future decarbonisation optionality.	[Red] Gas consumers would pay the costs for decarbonising electricity, rather than electricity consumers. This would tend to impact those who are unable to afford to install heat pumps, i.e. those with low incomes. The effects are pronounced in later years.	[Amber] Shift of low-carbon electricity costs will allow electricity-only households to avoid paying the policy costs they are directly benefitting from.	[Red] Shift to gas would particularly impact fuel poor households and is highly regressive. The number of fuel poor households could grow more materially 2035. Impact would grow over time as some households shift to electricity for heating. Whilst more well-off households could be able to avoid costs by switching to electric heating, poorer households may not have the option.
Proportionate	[Green] Incentivises the installation of heat pumps as households avoid half of policy costs if they have only one network connection. Maintains effective carbon price on electricity and gas as they both decarbonise – since policy costs reduce for each fuel as it decarbonises.	[Green] Partial shift of cost from electricity to gas is not fully cost-reflective, but this is a balance to avoid some households sharing an excessive burden. For example, by 2050 policy cost are £243 for electricity only households, and £574 for dual fuel consumers (using electricity and hydrogen).	[Amber] Even split of future heating decarbonisation costs ensures relative causality over time.	[Red] Partial movement of costs from electricity to gas impacts fuel poor (although to a lesser extent than shift-to gas). Analysis suggests the number of fuel poor households would increase by 2035, but by less than shifting policy costs to gas.

Conclusion

Summary

There is no easy option when it comes to allocating energy policy costs, either now or in the future as we decarbonise the energy system. The distributional impacts of any approach are significant and there is a danger of reducing the clarity of market signals to decarbonise if overall energy costs are reduced.

Many of the policies for which costs are recovered have wider benefits for society rather than to specific groups of consumers. This is particularly apparent when considering the cost of decarbonising electricity generation where there is little direct benefit to an individual household but a large indirect benefit to society as a whole. Furthermore, there is little to link to an individual's usage and their ability to reduce cost impacts beyond simply reducing overall energy use.

Our report therefore sets out the argument for recovering these costs not through bills but through general taxation. This would be more progressive in general and protect consumers on low incomes; an issue that will only grow in importance as investment in low carbon technology increases.

Despite these benefits however, the realities of delivering such a change in the context of current fiscal challenges means shifting energy policy costs to general taxation would be difficult. Assuming these costs led to a corresponding increase in the general level of taxation the current suite of energy policies alone implies an increase in the overall tax burden of £10bn a year, rising to £20bn in future. Such a decision at a time of macro-economic challenges and close to a General Election is likely to be difficult.

Should government choose to continue to recover policy costs through bills therefore, it is important for policy makers to recognise the way in which policy costs can distort consumption patterns and undermine economic efficiency. In the worst case, the distortions may even incentivise the use of more, rather than less, carbon intensive energy sources, for example by perpetuating the existing situation where heat pumps cost more than gas boilers to run. Given UK electricity supplies now have a lower carbon intensity than gas, the current approach falls into exactly this trap.

A straight shift of existing costs to gas would be a highly regressive approach however, with serious distributional consequences regardless of heat policy choices.

Our modelling suggests dual fuel bills would nearly double by 2035, and households still on the gas network in 2050 would pay over 100 times as much in policy costs than electricity only households. These risks impacting those on the lowest incomes who are less able to switch away from gas, as well as materially reducing the incentive to switch some or all the gas system to hydrogen, depending on the UK's eventual heat decarbonisation pathway.

As a result, assuming it is impractical to shift the payment of energy policy costs to general taxation, we conclude an approach where energy policy costs are allocated to bills in proportion to the number of consumers remaining connected to each network at that time. This would ensure an effective price signal is maintained on electricity bills and those who install heat pumps do not effectively avoid the cost of the provision of clean electricity. It would however ensure the running costs of a heat pump are not a barrier to their installation. Finally, it would also reduce any artificial distortion to overuse electricity, such as following a decrease in bills due to policy cost re-allocation, which comes at a societal cost.

A proportionate approach would also ensure that those who benefit from decarbonisation – such as those who switch to heat pumps – pay a proportionate share of providing that low-carbon heating supply. It would also minimise the growing distributional impacts of switching policy costs to the gas bill over time as the number of consumers connected to the gas network likely reduces.

Recommendations:

Our recommendations are therefore as follows:

1. **The payment of energy policy costs should be shifted into general taxation.**
2. Assuming shifting costs into general taxation is not possible, allocating energy policy costs between bills using **a proportionate approach to the allocation of current and future policy costs is likely to be the next most desirable option.**
3. Regardless of approach, given energy policy costs will rise under all approaches as we deliver net zero, **any changes to the allocation of policy costs should therefore be accompanied by an increase in the level of support provided to fuel poor households, for example through the Warm Home Discount such that the most vulnerable consumers are protected.**

Appendix

Modelling methodology and assumptions:

All costs in this report are reported in 2023 prices. Where necessary, costs have been inflated or deflated to 2023 prices based on the CPIH index.

Table 13 sets out the approach used to estimate policy costs. Unless otherwise stated, the costs of each scheme are based on the Ofgem price cap in effect during the third quarter of 2023, and projects these costs between 2024 and 2050 using the bespoke approaches set out below, which reflect the different determinants and nature of each scheme. Unless otherwise stated, all CCC assumptions are obtained from the CCC's 6th Carbon Budget publications[17].

In the results tables in the sections above, this report shows results for benchmark consumption households based on Ofgem's Typical Domestic Consumption Values (TDCV) for a medium-sized household, as per the July 2023 Price Cap decision; 3.1 MWh electricity and 12 MWh gas. It then assumes household consumption of gas and electricity changes in line with CCC forecasts of national domestic consumption trends, which vary according to each of the CCC's decarbonisation pathways.

Where the report discusses consumption for a benchmark heat pump household, it relies upon CCC assumptions about heat pump and hydrogen boiler efficiency and Ofgem's TDCVs. It assumes a boiler household consumes 11.4 MWh gas and 2.95MWh electricity in each year, made up of the standard medium-sized household benchmark, but assuming 5% of average gas consumption is for non-heating (i.e. cooking) and that 5% of current electricity consumption is attributable to homes which already use electricity for heating. As per the CCC's assumption, a hydrogen boiler is equally efficient to a (methane) gas boiler.

Meanwhile, based on the CCC's estimate of the relative efficiency of air source heat pumps compared to gas/hydrogen boilers, a home switching to a heat pump will consume an additional 3.04 MWh of electricity, meaning they consume 5.66 MWh of electricity in total per year (and no gas).

Where the report discusses household income in the future, it relies upon ONS estimates of median disposable income, updated to future years based on OBR forecasts of real GDP growth[18].

This report primarily relies on energy price projections provided by DESNZ and National Grid. For wholesale electricity prices, this report uses DESNZ's 2023 "Updated Energy and emissions Project (UEEP) "reference scenario"[19]. For the "high prices" sensitivities, this report relies on the UEEP "extended high" scenario from the same publication[20]. For wholesale gas prices, this report relies on National Grid's 2023 Future Energy Scenario (FES) estimates[21].

The UK government does not currently publish forecasts of household energy costs. Therefore, where the report discusses household energy bills, it uses retail prices from the most recent DESNZ UEEP edition to forecast per-unit household electricity and gas prices in 2019, updated for the more recent estimates of wholesale prices set out above[22]. The UEEP projections assume future gas and electricity prices include the current level and allocation of policy costs; therefore the results reported in this report normalise bill projections to remove DESNZ's assumed policy costs and add-back in the policy cost assumptions from each of the scenarios reported here.

17. CCC (December 2020), The Sixth Carbon Budget: The UK's path to Net Zero. 18. After 2028, this report assumes a long-run average real GDP/income growth rate of 2.0%.
19. https://www.gov.uk/government/collections/energy-and-emissions-projections. Note that UEEP projections are not available for 2050, therefore this report assumes gas prices are equal (in real terms) to 2035, while electricity prices fall by 13% (in real terms) in line with the CCC's assumptions for end-user prices. 20. Since the UEEP does not project prices between 2040 and 2050, this report relies on the CCC's 2020 estimate of annual changes in electricity prices to project prices until 2050, 21. Since National Grid's 2023 FES has redacted its price forecasts over the next 5 years, this report interpolates prices for this period based on today's wholesale price and the annual change projected in the 2022 FES. 22. Where necessary, this report also normalises energy retail price projections to remove DESNZ's assumed policy costs, and adds back the policy cost estimated in this report.

Table 13: Methodology for policy cost projection estimates

Scheme	Our approach
Renewables Obligation (RO)	Assumes that cost of the RO falls to zero over the next 15 years as RO-supported power plants stop receiving support after 20 years, and since the scheme closed to new plants in 2017. Rate at which plants will leave the scheme is based on the year-to-year growth rate in RO Certificates issued between 2002 and 2019.
Contracts for Difference (CfD)	This report assumes support for future low-carbon generation is based on the existing CfD model – with the exception for new nuclear generation (see below). While the design of future renewables support is likely to change compared to today's CfD, the support offered by a CfD mechanism is a reasonable proxy of the long-term cost of supporting new generation, even if the design of these schemes change. Around 90% of future CfD costs are associated with supporting future power plants. For CfDs associated with existing plants, and as a simplifying assumption, our model assumes cost falls to zero over the next 15 years, with generation from existing CfD plants falling from 2021's level at a rate of 1/15th per year, and with (remaining) costs indexed to wholesale power costs e.g. falling as wholesale power prices increase[23]. For CfDs for new future power plants, our model uses CCC estimates of levelised costs for different generating technologies for the 'strike price', generation from different forms of renewable energy (intermittent, firm and dispatchable), and wholesale power costs for the 'reference price'. The model assumes future low-carbon generation is supported by CfDs wherever levelised costs are higher than the wholesale price, which in practice leads this report to assume that firm and dispatchable renewables are supported by CfDs, whereas intermittent renewables are not. Finally, the model assumes some low-carbon generation in the short-term is not eligible for CfD support based on existing supply from generators not on the CfD scheme, but that the share of generation from these plants falls to zero over time; e.g. existing nuclear plants, and plants supported by the RO.
Nuclear RAB	The model assumes nuclear projects (other than Hinckley Point C – which is already contracted to receive a CfD) are funded by the new Nuclear RAB model. Costs are estimated in a similar way to the CfD (see above) but with two key differences: • First, it is assumed that the risk sharing mechanisms of the RAB model reduce financing costs, and therefore reduces the levelised cost of new nuclear by 25% compared to the CCC's estimated levelised costs. • Second, it is assumed that some of costs to consumers are incurred during the construction phase, i.e. prior to generating electricity. For the purpose of this report, it is assumed that £300m per year of costs are recovered each year between 2026 and 2035, in line with the government's assumptions[24]. Therefore, during the assumed 60-year operational lifetime of new nuclear plants, costs are reduced by £50m per year.
Feed-in-Tariff	Assumes the FiT supports relevant generators for 20 years after they first generated. Due to the closure of the FiT in 2019, the cost of FiT is used at today's level until 2029, and then falls to zero between 2030 and 2040, based on the rate at which new generation came on-line between 2010 and 2020.
Green Gas Levy	Uses BEIS' impact assessment forecast of the annual cost of the Green Gas Levy from 2024 onwards, and DESNZ's estimate of scheme costs in 2023. Assumes it is levied on a per-meter basis, in line with BEIS' proposal when the scheme begins, but note that government hopes to move to a per megawatt hour recovery once appropriate industry systems are in place.
Energy Company Obligation	Assumes the total cost of the ECO scheme increases to £1bn per year in 2022, as per the government's impact assessment. Assumes the ECO closes in 2026, to avoid double-counting future costs of installing insulation, which is counted elsewhere.
Warm Home Discount	There is significant uncertainty about the future design and trajectory of the WHD scheme. In light of this, this report assumes the cost increases only slightly over time, in line with the total growth in number of households (meaning the scheme continues to apply to approximately 10% of all households). This report includes a sensitivity where the WHD is extended to cover policy costs; which is calculated as a rebate for WHD recipients of the cost of all non-WHD scheme costs. In these sensitivities, the only policy costs paid-for by WHD recipients is their share of total WHD costs.
Smart Meter Programme	Assumes a cost of £5 per electricity and gas household per year for the next five years, to represent the cost of installing gas and electricity smart meters. The report does not account for ongoing costs associated with the DCC network, since these tend to displace suppliers' own operating costs associated with metering.
Capacity Market	Assumes capacity market costs increase from today's cost in proportion to the share of intermittent generation on the electricity grid according to CCC forecast.

23. In practice, the volatility of wholesale prices the modelled CfD levy in this report do not provide an accurate estimate of the actual levy charged on suppliers and consumers in any given year, given the unpredictable 'true up' for forecasts is making up a large share of its current costs at present. However, this modelling approach provides a reasonable estimate of the price over the longer-run, in light of uncertainty about the level of electricity prices in the future

24. Specifically, the government estimates an impact on an average household of around £12 per year during the construction phase.

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