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FOUR STEPS TO UNLOCK UK HEATING BILL REDUCTIONS OF OVER £400 – ANNEXES

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This document accompanies the briefing *Low Carbon, Lower Heating Bills: Four steps to unlock UK heating bill reductions of over £400*.[1]

Annex A sets out the methodology used to arrive at the estimates set out in the main briefing.

Annex B gives further detail on two potential options for protecting electric heating from the impact of levies.

Annex A: Methodology

NOTE: All estimates reflect average conditions. Results may differ at the household level, depending on building efficiency, heating system design, changes in occupancy patterns, and tariffs. The aim of this analysis is to provide indicative figures for the effect of policies on a "typical" household.

Proportion of heat electrification grants received by "able to pay" households

The main briefing states 55% of households who received grants for heat electrification were wealthier "able to pay" households. This is based on government figures for the number of households supported through the various funding routes available. These figures are set out in the table below.

The Boiler Upgrade Scheme provides a capped grant to cover part of the cost of replacing fossil fuel heating system. Households supported through this route

[1] Available from **https://www.e3g.org/publications/heat-pumps-could-have-potential-to-halve-uk-heating-bills/**

will therefore have paid for the proportion of the work not covered by the grant, and are thus classified as "able to pay". The other schemes are specifically targeted at low-income households.

Homes which have received government support since 2020 (as of June 2025)

Scheme	Heat pumps installed	Percentage of total
Boiler Upgrade Scheme (BUS)[2]	56,489	55.1
Local Authority Delivery (LAD)[3]	2,024	2.0
Home Upgrade Grant (HUG)[3]	4,325	4.2
Social Housing Decarbonisation Fund (SHDF)[4]	2,923	2.9
Energy Company Obligation (ECO)[5]	30,970	35.9
Total	**102,532**	

Household heating demand in 2025

Hot water

Annual heat consumption for hot water can be estimated using the formula:

mass of water used daily × temperature change × specific heat capacity of water × 365.25 days

The resulting energy use in kJ is converted to kWh by dividing by 3,600.

We used the following estimates in the calculation:

> amount of water used per person per day: 40 litres (= 40 kg)[6,7]

[2] UK government (2025) **Boiler Upgrade Scheme Statistics** (as of June 2025)

[3] UK government (2025) **Green Homes Grant Local Authority Deliver (LAD) and Home Upgrade Grant (HUG) statistics** (as of June 2025)

[4] UK government (2025) **Social Housing Decarbonisation Fund statistics** (as of June 2025)

[5] UK government (2025) **Household Energy Efficiency Statistics, headline release June 2025**

[6] UK government (2024). **Domestic hot-water use** (Accessed August 2025).

[7] Hot Water Association (2025). **Sizing a Hot Water Cylinder** (Accessed August 2025).

- temperature change: 50 °C[8]
- specific heat capacity of water: 4.186 kJ/kgK
- typical occupancy figures for: low consumption: 1.5 people; average consumption: 2.5 people; high consumption: 4.5 people (based on Ofgem data).[9]

This gives an energy use for hot water of 850 kWh per person per year, or:

- 1,275 kWh_{heat} per year for low consumption households
- 2,125 kWh_{heat} per year for average consumption households
- 3,825 kWh_{heat} per year for high consumption households.

Space heating

Space heating consumption is estimated to account for 77.2% of gas usage, based on analysis by BEAMA.[10] Ofgem provides typical gas usage data for low, medium and high usage for on-gas households. Multiplying the latter by 0.772 gives an estimate of gas used for space heating. Multiplying this figure by typical gas boiler efficiency (90%) provides an estimate for heating demand in kWh.

Therefore, estimated heating demand is:

- 5,211 kWh_{heat} per year for low consumption
- 7,990 kWh_{heat} per year for average consumption
- 11,812 kWh_{heat} per year for high consumption

Gas consumption not used for either space heating or hot water is implied to be consumption for cooking. This consumption is not considered as part of this analysis.

[8] Assuming hot water stored at 60 degrees C and a mean inlet temperature of 10 degrees C. See also TMVA (2000). **Recommended Code of Practice for Safe Water Temperatures**

[9] Ofgem (2025). **Average gas and electricity usage** (Accessed August 2025).

[10] BEAMA (2022). **Analysis of kWh gas consumption in homes with gas central heating**

Total space heating and hot water demand is estimated at:

	Average consumption	High consumption	Low consumption
Space heating (kWh heat)	7,990	11,812	5,211
Hot water (kWh heat)	2,125	3,825	1,275
Total (kWh heat)	**10,115**	**15,637**	**6,486**

Annual heating bill estimates (for Figures 2 and 3)

For a gas heated household, the annual bill is equal to:

gas standing charge (daily rate × 365.25) + (gas unit rate × heat demand / gas boiler efficiency)

As heating forms the majority of household gas consumption, the gas standing charge was included in gas heating cost calculations. Houses without gas heating are unlikely to maintain a gas network connection, and so unlikely to pay this charge. The electricity standing charge is not included in costs for electrically heated households, as this cost will be incurred regardless of the households' heating type. (i.e. Electricity standing charges form part of a households' "baseline" costs, but gas standing charges do not.)

The following assumptions were used, based on Ofgem data for average standing charges and unit rates under the energy price cap for July–September 2025:[11]

> gas standing charge: 29.82 pence per day (£108.92 per year)

> gas unit rate: 6.33p per kWh

> gas boiler efficiency: 90%

Therefore, the estimated annual heating bill for a household with average heating consumption (10,115 kWh) is £820.35.

[11] Ofgem (2025). **Changes to energy price cap between 1 July and 30 September 2025**

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Electrically heated households without flexible usage

For an electrically heated household, the bill estimate varies depending on assumptions made about the tariff used, operating efficiency of the heating system, and use of time-of-use tariffs.

For an electrically heated household without a time-of-use tariff, the annual bill is equal to:

electricity unit rate × heat demand / electric heating efficiency

The assumptions for each scenario are set out in the table below.

Scenario	Electricity unit rate (p/kWh)	Heating efficiency	**Annual bill (average consumption)**
Heat pump baseline	25.73	280%	**£929.51**
Heat pump (reduced renewables cost)	23.15	280%	**£836.31**
Heat pump (reduced renewables, levies removed)	19.05	280%	**£688.19**
Heat pump (reduced renewables cost, levies removed, efficiency improved)	19.05	350%	**£550.56**
Resistive heat baseline	25.73	100%	**£2,602.64**
Resistive heat (reduced renewables cost)	23.15	100%	**£2,341.67**
Resistive heat (reduced renewables, levies removed)	19.05	100%	**£1,926.95**

The baseline electricity unit rate is based on Ofgem data for average unit rates under the energy price cap for July–September 2025 (in line with the data used to estimate gas heating costs).

We estimated the unit rates reductions used in this briefing based on further analysis of modelling undertaking on behalf of E3G by Baringa. The scope of this modelling and further outcomes are covered in more detail in our 2025 report *The UK's Clean Power Mission: Delivering the Prize.*[12] Our analysis produced the following estimated reductions in the retail unit rate, relative to 2025 prices:

> actions to reduce renewable costs (conservative estimate, only some recommendations enacted): 2.58p/kWh

> removing the Renewables Obligation and Feed-in-Tariff levies from electricity used for heating: 4.1p/kWh.

Electrically heated household with flexible usage

For an electrically heated household **with** a time-of-use tariff, the annual bill is equal to:

[(off-peak electricity unit rate × off-peak-time heat demand) +

(standard electricity unit rate x standard-time heat demand)] /

electric heating efficiency

In homes where heat pumps or other electric heating is used, hot water is typically stored in an insulated cylinder. This provides excellent opportunities for demand-shifting, as hot water can easily be stored for several hours before use. Space heating is more complex, and the potential for load-shifting will vary depending on how well insulated the home is. However, research suggests most homes could use pre-heating to shift space heating demand by several hours without compromising on comfort.[13] We assume 50% of space heating and 100% of hot water can be provided on off-peak rates.

We assume that the off-peak rate is 10p/kWh cheaper than the standard rate, in line with current available tariff offerings from major energy suppliers (e.g. EDF's Heat Pump Tariff). Some existing "economy" tariffs offer a substantially larger off-peak rate discount than this, but at the cost of a higher "peak" rate. While using these figures would have given a lower heating bill in our analysis, it would potentially result in an increase in a household's non-heating electricity bill, depending on the household's ability to shift other electricity use. For consistency, we have therefore applied the more conservative assumption.

[12] E3G (2025). **The UK's Clean Power Mission: Delivering the Prize**

[13] Nesta & Centre for Net Zero (2024). **HeatFlex: the untapped potential of automated heat pump flexibility**

The assumptions for each time-of-use tariff scenario are set out in the table below.

Scenario	Standard rate (p/kWh)	Off-peak rate (p/kWh)	Heating efficiency	**Annual bill (average consumption)**
Heat pump (all improvements, with smart tariff)	19.05	9.05	350%	**£375.70**
Resistive heat (all improvements, with smart tariff)	19.05	9.05	100%	**£1,314.94**

Estimating household consumption in 2050 (for Figure 1)

The average UK household in 2025 consumes 2,700 kWh of electricity per year, according to Ofgem data.[14]

By 2050 we expect the typical UK household will have two major additional sources of electricity consumption: heating and electric vehicle(s). We assume consumption for other electrical appliances remains at ~2,700 kWh per year. While many household appliances will have increased in efficiency by 2050, it is also likely households will increase the number of appliances they use (e.g. some households may also begin using electricity for cooling), offsetting these efficiency gains.

Average car mileage in the UK in 2023 was 7,000 miles per year.[15] Electric vehicles currently achieve 0.2–0.5 kWh per mile, with an average of about 0.3 kWh per mile.[16,17] This suggests an average electricity consumption of ~2,100 kWh per year for a household with a single electric vehicle.

[14] Ofgem (2025) **Average gas and electricity usage** (Accessed August 2025).

[15] UK government (2024). **Vehicle mileage and occupancy** (Accessed August 2025)

[16] Electric Vehicle Database (2025). **Energy consumption of full electric vehicles** (Accessed August 2025)

[17] Electric Car Guide (2024). **How much electricity does an electric car use?** (Accessed August 2025)

Petrol vehicles average about 36 miles per gallon, or 1.17 kWh per mile.[18,19] Therefore, the average petrol consumption for a single vehicle household would be equivalent to ~8,200 kWh.

As set out above, the estimated heating demand for a UK household with average consumption is 10,115 kWh. A heat pump with SCOP of 3.5 can deliver this with an electricity input of 2,529 kWh. A boiler with an efficiency of 90% requires a gas input of 11,239 kWh.

In total this suggests the potential for domestic household electricity consumption to increase by ~170% from 2,700 kWh per year to over 7,300 kWh per year. This aligns with wider expectations for increases in electricity consumption as the UK electrifies, with the NESO 2025 Future Energy Scenarios predicting an increase in electricity demand from 290 TWh in 2024 to between 700 and 800 TWh in 2050.[20] However, fossil fuel consumption (and primary energy demand) will have decreased by a larger amount.

Estimating potential savings from complementary improvement measures

Insulation

Which? estimate loft insulation could reduce bills by £180–£340 per year for a household with a gas boiler, depending on household type and based on July 2024 prices.[21] Similarly, Which? estimate that cavity wall insulation could reduce bills by £110–£410 – again for a household with a gas boiler, depending on household type.[22]

According to Ofgem, average price cap gas unit rates in July 2024 were 5.48p/kWh.[23] Adjusting these savings to reflect the lower running cost savings of the best available heat pump scenario imply savings of:

> **loft insulation:** £125 to £240 per year

> **cavity wall insulation:** £75 to £290 per year.

In practice these savings are an underestimate. Improved insulation improves the ability of a household to shift their heat demand in response to time-of-use

[18] NimbleFins (2025). **Average MPG for Cars UK (2025)** (Accessed August 2025)

[19] UK government (2025) **Digest of UK Energy Statistics (DUKES): calorific values and density of fuels**

[20] NESO (2025**) Future Energy Scenarios 2025** (p21)

[21] Which? (2025) **Loft Insulation Costs And Savings: How Much Does Loft Insulation Cost?**

[22] Which? (2025) **Cavity Wall Insulation Costs And Savings**

[23] Ofgem (2024) **Changes to energy price cap between 1 July to 30 September 2024**

tariffs (i.e. “pre-heating” during a cheaper rate to ensure the house is warm for the duration of a peak period). As set out above, this demand-shifting behaviour is a major opportunity for households to reduce their heating bills.

Adjusting the savings to reflect the gas unit price used in this briefing (6.33p/kWh) would imply savings for a gas boiler in 2025 of:

> **loft insulation:** £210 to £400 per year

> **cavity wall insulation:** £125 to £475 per year

Solar panels

Solar panel output varies significantly depending on location and orientation. The financial savings achieved from a solar panel will also vary substantially depending on the degree to which electricity is consumed on-site or exported, and the household’s electricity tariff. The savings estimate in this briefing assumes 100% self-consumption and is based on:

annual solar output (kWh) × household electricity unit rate (p/kWh)

Output for a 3.5 kW_p solar array is estimated at 3,325 kWh per year, based on an output of 950 kWh/kW_p.[24]

The financial savings received depend on the unit rate offset:

> **current price cap (25.73p/kWh):** £855 per year

> **all recommendations scenario – peak rate (19.80p/kWh):** £660 per year

> **all recommendations scenario – off-peak rate (9.8p/kWh):** £325 per year

[24] Solargis (2021) **Solar resource map**

Annex B: Options for targeted levy exemption

E3G has developed two potential options which would allow for electric heating to be protected from the impact of levies.

Clean Heat Discount

In 2023 we outlined proposals for a Clean Heat Discount. This discount would be a rebate on 3.5 MWh of electricity per year for electrically heated homes. We estimated this would reduce bills for these homes by £130 per year, at a cost of £390m per year. More details can be found in our 2023 briefing *Electricity Levy Rebalancing: Make clean heat accessible to all UK households*.[25]

Affordable Electric Heating Tariff

Since then, we have also developed an alternative option called the Affordable Electric Heating Tariff (AEHT). Rather than paying levies and then receiving a rebate, this tariff would be exempt from certain levies on electricity used for heating – i.e. Renewables Obligation and Feed-in-Tariffs would not be collected on electricity used for heating under this tariff. The tariff would also include conditions to ensure electric heating becomes more efficient and smart-ready, ensuring households are ready to access off-peak electricity rates if they wish to do so.

The AEHT could be funded by government, but could alternatively be self-funded via electricity bills at no cost to the treasury. This approach would increase non-heat electricity bills by less than £30 per year, while offering average savings of ~£150 per year for households with a heat pump and over £400 per year for other electric heating users.

Option	Clean Heat Discount	Affordable Electric Heating Tariff
Rebate or exemption	Rebate (levy paid but reimbursed)	Exemption (No levy payment)
Eligible households	All electrically heated households (~3m)	All electrically heated households (~3m)
Volume of payment	Fixed 3.5 MWh per household (~£130 per year)	Metered usage (with deemed usage for some households under transitional arrangements)

[25] E3G (2023). **Electricity levy rebalancing: Make clean heat accessible to all UK households - E3G**

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About E3G

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We drive systemic action on climate by identifying barriers and constructing coalitions to advance the solutions needed. We create spaces for honest dialogue, and help guide governments, businesses and the public on how to deliver change at the pace the planet demands.

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