

A policy plan for decarbonising homes



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Summary

Reducing carbon emissions from our homes is a crucial step in reaching net zero, and it is essential to make significant progress on this by 2030. Home heating accounts for around 14 percent of the UK's emissions, and gas or oil boilers are among the single most polluting items most households own.

The most effective way to decarbonise home heating is to replace gas and oil boilers with efficient low-carbon heating systems, such as heat pumps. The technology already exists to do this: heat pumps are a mature technology, and are widely used in many other countries. Almost every home in the UK will be suitable for a low-carbon heating system of some kind, whether an air source heat pump, a heat network or a variation such as a shared ground source heat pump.

However, the UK's uptake of low-carbon heating has been extremely slow – now the slowest among all European countries for which data is available¹. On the current trajectory and under current policies, the UK will be severely delayed in decarbonising home heating, which risks both failing to meet net-zero targets and leaving households overly reliant on imported gas for heating.

To change course, the UK needs a stronger set of policies focused on replacing boilers with heat pumps and other low-carbon heating systems. This policy plan should have four key elements.

1. Committing to **phase out gas boilers** by 2035 or earlier, while also providing clarity on the future role of hydrogen for home heating.
2. Making low-carbon heating **affordable** for all, most importantly by reducing the cost of electricity relative to gas.
3. Supporting a rapid increase in the number of **skilled heat pump installers**.
4. Better **planning** for electrification and low-carbon heating systems.

These four measures should be implemented immediately as a 'Plan A'. However, it is reasonably likely that they will be insufficient to increase the uptake of low-carbon heating rapidly enough to help the UK catch up with other countries. Therefore, the UK government and devolved governments should also begin developing plans for more

powerful policy levers, which can be deployed in the next few years if the uptake of low-carbon heating fails to accelerate sufficiently.

These additional policies may include:

- giving energy retail companies mandatory targets for installing low-carbon heating each year
- more radical financial incentives for low-carbon heating, including larger subsidies and energy cost guarantees
- shifting to an Energy Service Company-style model for selling heat and energy together.

The UK government and devolved governments may also prefer an alternative, more planned approach to decarbonising heating. This could mean some combination of:

- **heat zoning** – identifying a preferred low-carbon heating source for every neighbourhood (eg, air source heat pump, heat network)
- **street-by-street transitions** – switching whole neighbourhoods to low-carbon heating in one go, with installations planned as large infrastructure projects
- **public entities responsible for meeting heat decarbonisation targets** – replacing some aspects of the energy system, such as energy retailers, with public bodies that have a duty to install low-carbon heating while also keeping energy bills low.

This kind of planned approach may be more appropriate in specific places, such as urban centres where heat networks are the best option and should remain under consideration as an option.

1. Context: the home decarbonisation challenge

Decarbonising home heating is the biggest net-zero challenge of the next decade.

Heating homes with gas and oil boilers produces around 14 percent of the UK's carbon emissions. There has been little progress in reducing this over the last decade, and in contrast to the other major sectors that need to decarbonise fast over the next decade – electricity and surface transport – home heating is currently off track on its net-zero transition².

The key to decarbonising homes is to replace boilers with clean heat sources.

Insulating homes has numerous benefits, including reducing fuel poverty and making homes more comfortable and healthier, but has a relatively modest role in reducing carbon emissions. The Climate Change Committee anticipates energy efficiency will only account for eight percent of the reduction in residential emissions by 2050³. By contrast, installing low-carbon heating (either at building scale or via heat networks) will account for 87% of emissions reductions by 2050 in the Sixth Carbon Budget – more than ten times the carbon savings of insulation. The case for retrofitting homes to tackle fuel poverty is overwhelming, but it is much less strong for households that can afford to heat their homes adequately.

The cost of insulating all UK homes to Energy Performance Certificate (EPC) 'C' standard is likely to be around the same as the cost of installing heat pumps or other low-carbon heating devices in all homes. UK Finance estimates that getting all UK homes to EPC 'C' would cost £250 billion in total⁴, an average of £16,000 per home that needs upgrading. Delivering that between 2025 and 2030 would cost around £42 billion per year from public and private sources.

If the objective is reducing carbon emissions, switching to low-carbon heat sources is the most cost-effective measure available. This suggests that prioritising low-carbon heating sources for most homes – while retaining a strong focus on improving fabric for households at risk of fuel poverty – will be the best way to get homes to net zero.

Heat pumps are the clear leading technology for replacing boilers. Heat pumps – including air source, ground source and larger heat pumps to power heat networks –

are now established as the clear leading technology for decarbonising home heating. Heat pumps are a mature technology which have been used in large commercial buildings for decades. Heat pumps are now being rapidly rolled out in homes across the USA and Europe, but the UK trails behind other European countries on annual heat pump sales⁵.

Contrary to widely held beliefs, **heat pumps do not require high levels of insulation** to work effectively. A heat pump system can efficiently heat almost any home as long as it is properly designed⁶. **Heat pumps also work well in cold weather**. They are very common in Scandinavia, despite the cold climate, while Northern Scotland leads the way for heat pump adoption in the UK.

Other home heating technologies are highly unlikely to compete with heat pumps in most homes.

- **Hydrogen** for home heating remains an unproven technology, and even if it does mature it will be far more expensive to run than heat pumps⁷; green hydrogen typically requires six times more renewable energy per unit of heat than a heat pump.
- Direct electric technologies, such as **electric boilers** and **infrared**, may play a role in some homes but will likely have much higher running costs, because they typically use three times as much energy per unit of heat as heat pumps⁸.

Heating homes efficiently with green electricity can be cheaper, more comfortable, safer and healthier than current methods. Upgrading heating systems in UK homes will be disruptive – just as it was when we switched to central heating in the 1960s and 1970s, or added indoor bathrooms to old housing stock in the 1940s and 1950s. But UK homes will be better as a result. We've become used to turning the heating on for a few hours a day, veering between cold and hot, just because that's how most boilers are set up to work. Keeping homes at a steady temperature, as heat pumps do, is more comfortable, helps prevent damp and mould, and is better for people with asthma, as it reduces air currents that circulate dust. Getting rid of gas hobs reduces indoor air pollutants like nitrogen dioxide.

Combining electric heating with other home technologies such as electric cars and solar PV, and using renewable electricity when it's most plentiful and cheapest, could slash household bills and make the electricity system cheaper to run for everyone. There's great potential for more collective ownership, with companies like Ripple already offering people the chance to own a share of a wind farm as part of a co-op.

We could see ground source heat collectors offered as a public utility, with people able to connect their own individual heat pumps. As the UK rapidly expands production of homegrown green electricity, households should see the benefit in terms of comfort, health and affordability. This can be achieved by electrifying our homes.

However, there are still challenges that the low-carbon heating industry needs to address. Some of the issues – high costs, planning barriers and workforce skills – are areas that government policy should help to address, but there are other areas where the onus is on industry to improve its offer. In particular, the experience of buying a heat pump or other low-carbon heating system is complex and challenging for most customers. There is a pressing need for innovation in service design, as well as in technology, in the low-carbon heating industry. Government policy should press the industry to improve in this area, combining innovation funding with standards and, where needed, regulation.

2. How quickly should the UK go on low-carbon heating?

Reaching the no-new-boilers threshold

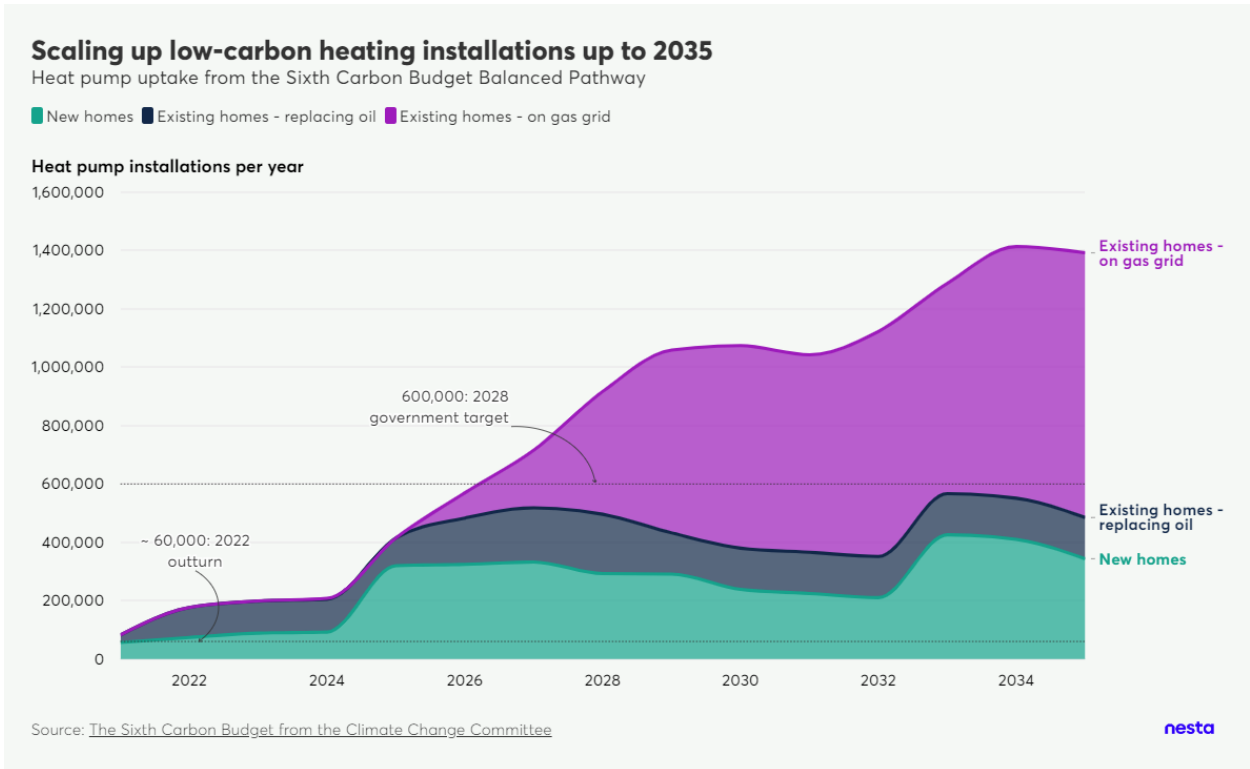
The UK is currently installing around 60,000 heat pumps per year⁹ (many of these in new homes) compared to up to 1.7 million boilers per year¹⁰. The goal should be for low-carbon heating systems, primarily heat pumps and heat networks, to replace all boilers – reaching around 1.7 million installations per year as soon as possible.

low-carbon heating should generally be installed when boilers get towards the end of their lives, rather than replacing newer gas boilers. Once this 1.7 million threshold is reached – with no boilers being installed – it would take around 14 years for almost all boilers to be replaced. Based on this, the UK would need to reach this threshold by 2036 at the very latest to achieve net zero for home heating by 2050 – although this would likely leave some boilers remaining in place in 2050. Getting to no-new-boilers earlier – ideally by 2033 or sooner – is a more reliable way to get to net zero.

Scaling up from now to 2030

The UK government currently has a target to increase heat pump installations to 600,000 per year, from around 50,000 currently (this target includes new homes). This target is less ambitious than recommended by the Climate Change Committee's Sixth Carbon Budget, but still remains challenging on current trajectories. Ultimately, the most important target is to reach up to 1.7 million low-carbon heating systems installed each year by 2035 (or sooner if the boiler phase-out date is earlier than 2035). This will require significant policy changes, and crucially clear, stable signals to the heating industry to give it confidence to invest in mass low-carbon heating installation in the UK.

The chart below shows the Climate Change Committee's Balanced Pathway for scaling up low-carbon heating installations up to 2035, as part of the Sixth Carbon Budget. Installations in new homes, and replacing oil and direct electric heating systems, should provide an initial baseline of around 400,000 installations a year from 2025 onwards, but the key challenge is scaling up the replacement of gas boilers year-on-year.



In scaling the uptake of heat pumps, there is a challenge of raising demand and supply at the same time. The low-carbon heating industry cannot scale up to supply 1.7 million installations a year instantaneously – it will need to build up capacity (and crucially train more workers) over a number of years. However, this can only happen if the demand for low-carbon heating increases in tandem with the industry. If demand is perceived to be low, businesses will not invest or train in low-carbon heating. However, if there is a shortage of installers, demand will be unmet, which may discourage people from trying to get low-carbon heating. Both consumers and the heating industry need clear, consistent signals to help ramp up the switch to low-carbon heating over time.

Addressing the risk of a slow heat pump scale up

The biggest risk on this trajectory is that low-carbon heating installations do not scale up rapidly in the years after 2027, especially to replace gas boilers. The policy measures proposed in this paper – including a phase out of fossil fuel boilers and making heat pumps cost competitive with gas boilers – may be enough to achieve scale up, but there is a risk they may be insufficient to increase demand. If the scale up is slow between 2028 and 2035, this presents two risks: that the heating industry cannot properly prepare for a boiler ban in 2035 (or sooner); and that there is a backlash against low-carbon heating, which causes the ban to be deferred (which would likely mean the UK missing its net-zero goal).

The following are policy options available to avoid the risk of a slow scale up.

- Setting mandatory heat pump sales targets, escalating each year, for energy companies and possibly mortgage providers. This would mirror the UK government's Clean Heat Market Mechanism consultation¹¹, which is proposed to apply to boiler manufacturers, but would apply it more widely and stringently to those selling energy to households.
- Providing much more attractive financial incentives for low-carbon heating. This may involve much larger subsidies for heat pumps and low-carbon heating; or making electricity much cheaper compared to gas. (Scotland already offers larger subsidies for installing a heat pump than England and Wales.)
- Mandating, incentivising or reforming energy retail companies to follow an Energy Services Company (ESCO) model. This would involve energy suppliers actively trying to help customers manage their energy and heating use more cheaply and efficiently.
- Adopting mandatory neighbourhood zoning for low-carbon heating. This would in effect set mandatory dates for people in different areas to switch over to low-carbon heating.

The UK government and devolved governments should develop these more radical options alongside more market-led approaches, to have them ready to introduce around 2027 or 2028 if required to accelerate the uptake of low-carbon heating. It is important that the low-carbon heating industry is initially able to develop better and cheaper services for households, and to build a degree of support for low-carbon heating, but extra measures may be required to ensure widespread uptake.

3. What policies are needed to accelerate the roll out of low-carbon heating?

Supporting the low-carbon heating roll out requires a comprehensive and stable set of policies. In rough order of importance, the UK government (and devolved governments where these policy levers are devolved) should adopt the following policies.

1. Commit to a phase-out date for gas boilers

Setting a phase-out date for new gas boilers – similar to the phase out of petrol and diesel cars in 2030 – is an essential signal to consumers and the heating industry about switching to low-carbon heating. Signalling a phase-out date will shape the behaviour of consumers and businesses many years in advance of the deadline, making switching to low-carbon heating more attractive.

The current UK government has suggested a 2035 phase-out date for fossil fuel boilers, although this is currently only indicative. The Skidmore Review¹² suggested moving this date forward to 2033 to accelerate progress to low-carbon heating. **The UK government and devolved governments should confirm a 2035 phase-out date for fossil fuel boilers, and consider going earlier if a transition is possible in a shorter time period.**

The government position on hydrogen for home heating also has a big impact on the impact of the phase-out date. At present, some parts of the heating and gas distribution industries assume that the phase out of fossil fuel boilers will mean a switch to boilers which burn hydrogen. This sends a message to many heating engineers and consumers that they do not need to take action – such as replacing boilers with heat pumps, or retraining to install heat pumps – because it will ultimately be unnecessary. In effect, this ambiguity on hydrogen is cancelling out much of the effect of a possible phase-out date, because it allows most people to delay action. **The UK government and devolved governments should send a clear, early signal that they expect hydrogen to play a small role in home heating**, with hydrogen supplies being targeted at other, harder to decarbonise areas of the economy, such as heavy industry.

In addition, there are other important regulatory measures that the UK government and devolved governments should promptly implement.

- **Ending the installation of gas boilers in new homes by 2025**, by ensuring the Future Homes Standard does not allow new gas grid connections. This will grow

the heat pump market into the hundreds of thousands in the short term, while preventing costly retrofits being needed in newly built homes.

- **Phasing out new oil and Liquid Petroleum Gas (LPG) boilers in all homes by 2026.**

Many homes in rural areas are off the gas grid, and use expensive and/or lower quality fuels to heat their homes. Switching to heat pumps is a more attractive proposition for these homes, but may need to be accompanied by additional support to help with the upfront costs of installing a heat pump.

2. Make low-carbon heating affordable for all

The upfront cost of putting in a first heat pump system is a key barrier to widespread adoption. Installing an air source heat pump typically costs over £10,000¹³, compared to £2,000-£4,000 for a typical gas boiler. However, heat pumps have the potential to be cheaper over their lifetime than boilers, if their running costs are made sufficiently low.

At present, heat pumps cost roughly the same as gas boilers to run each month. But government policy can reduce these running costs (primarily by making electricity cheaper), which should make them cheaper over their lifetime. This would then enable more widespread offers of finance (perhaps combined with subsidies), to enable every household to afford the upfront cost of a heat pump.

The example of electric vehicles – where cheaper running costs combined with the use of finance – could provide a good example of how to make the transition to low-carbon heating affordable for everyone. The goal should be for no one to have to pay money upfront for a heat pump (via finance), and for every household to be better off on their monthly bills (via lower running costs).

Nesta's analysis has shown that, while it's unlikely that heat pumps will ever compete with gas boilers on their upfront cost, it is possible for policy changes to make heat pumps cheaper over their lifetime¹⁴. This should make it possible for households to switch to a heat pump or similar low-carbon heating system and be financially better off, provided the right finance is available.

a) Reduce the cost of electricity

The key factor affecting the running costs of heat pumps (and all clean electric heating) is the ratio of electricity to gas prices. Heat pumps typically use three to four times less energy than a boiler (depending on how efficient the heat pump is), but electricity has typically been three to five times more expensive per unit than gas. The high relative price of electricity in effect cancels out the efficiency bonus brought by heat pumps.

The UK has one of the highest electricity to gas price ratios in Europe over the last decade. The UK's ratio has typically been around or above 4 in recent years, while in France, for example, the ratio is currently around 1:7. Countries with cheaper electricity relative to gas generally have higher rates of heat pump uptake. For the UK to adopt heat pumps en masse, and significantly reduce energy bills, making electricity much cheaper relative to gas is crucial. Nesta's research shows that if lower running costs and affordable finance is in place, up to 38% of homeowners would choose a heat pump to replace a gas boiler even at this early stage in their development¹⁵. This would be equivalent to almost 400,000 heat pump installations per year – around ten times the current rate.

The first key policy to achieve this is for **the UK government to permanently remove the environmental and social levies that are currently added to electricity**. This would reduce heat pump running costs by £110 a year for a typical home.¹⁶

In the medium term (five years and beyond), increasing the supply of renewable electricity should reduce electricity prices. This will happen because increasing renewables capacity will mean the electricity grid more frequently does not need any gas-fired power to meet demand, which will lower the price of electricity.

To give more confidence to the low-carbon heating market, and increase the incentives to reform the electricity market, **the UK government should set a cap on the electricity to gas price ratio**. Ideally this cap would reach 2.5 (electricity costing 2.5 times more per unit than gas), although the cap may need to start higher and gradually move to this level. This cap could be maintained either through taxes on gas, subsidies for electricity or by moving towards improving and greening the electricity market.

The broad options (which can be combined as needed) for achieving a cap on the electricity to gas price ratio are:

- taxing the price of gas, to make it more expensive relative to electricity

- subsidising the price of electricity, to make it cheaper
- changing the electricity market to make cheaper forms of electricity, such as renewables, set the market price rather than gas.

The long term aim should be for the electricity market to deliver cheaper, greener power. Setting a price cap which requires taxes or subsidies may provide an incentive for the UK government to accelerate progress towards electricity market reform.

The electricity to gas price ratio and heat pump affordability

The chart below shows the combinations of upfront heat pump costs and electricity to gas price ratios where a heat pump has the same lifetime cost as a gas boiler. For example, if gas is 7p/kWh (blue line) and if a heat pump costs £8,000 upfront and the electricity to gas price ratio is 2.6, the heat pump costs the same as a gas boiler over its life.

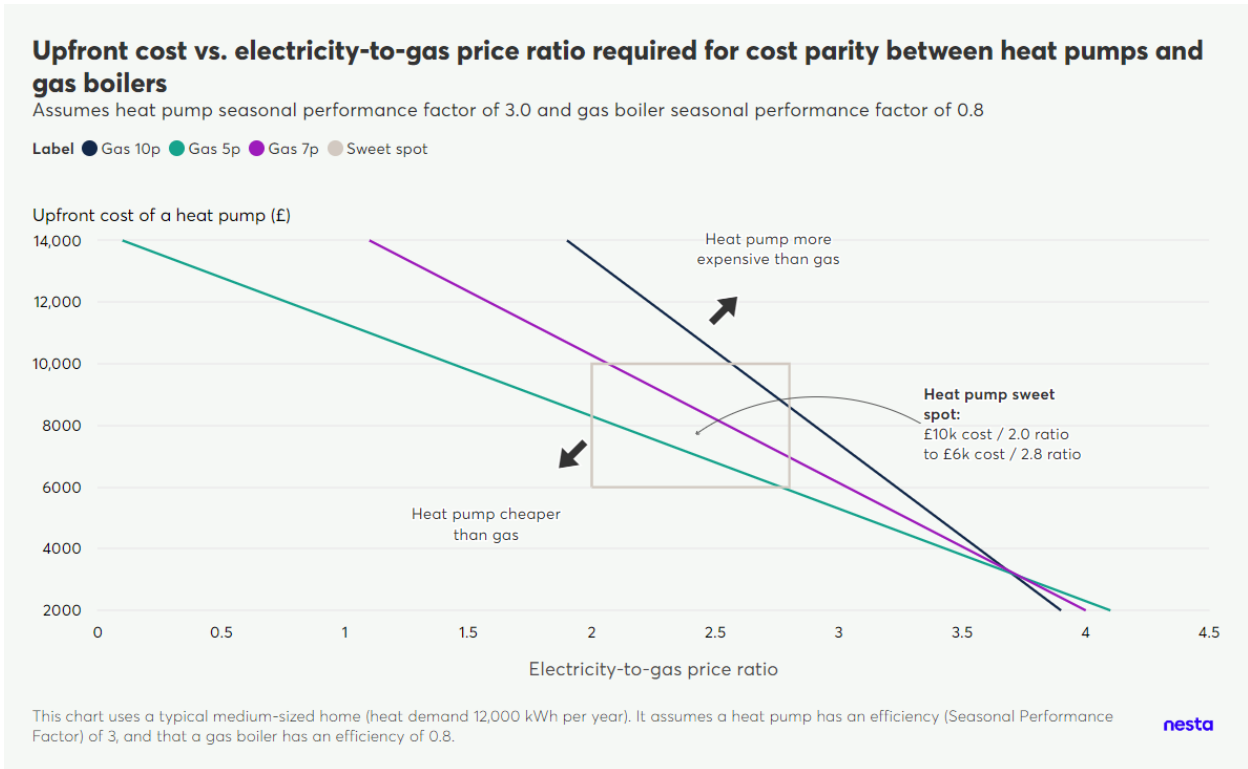
The different lines represent different gas prices. In general, the more expensive gas is, the more competitive heat pumps become (because it means that running costs matter more than upfront costs).

This analysis suggests there is a 'sweet spot' for heat pump affordability, under which heat pumps should always cost roughly the same or less over their lifetime as a gas boiler. This sweet spot is roughly between:

- upfront cost of £10,000 per heat pump, with an electricity to gas price ratio of 2.0
- upfront cost of £6,000 per heat pump, with an electricity to gas price ratio of 2.8.

If the combination of policies – including subsidies – can keep prices between these levels, heat pumps should always be at least as cheap over their lifetime as a gas boiler.

Note: This chart uses a typical medium-sized home (heat demand 12,000 kWh per year). It assumes a heat pump has an efficiency (Seasonal Performance Factor) of three, and that a gas boiler has an efficiency of 0.8.



b) Scale up finance and subsidies for low-carbon heating

Subsidies and low-cost loans both significantly increase the affordability and demand for heat pumps. When combined with lower running costs, Nesta's research suggests that subsidies and low cost loans both more than triple demand for heat pumps.

The UK government should significantly increase the number of low-carbon heating subsidies available in England and Wales from the current 30,000 per year. The case for subsidies is strongest in the earlier phases of growth in the low-carbon heating market, likely up to around 2028, the date the current Boiler Upgrade Scheme runs to. Relaxing the cap on the number of subsidies available would give the market confidence that support will remain available and should lead to more rapid growth in heat pump installations.

The UK government and devolved governments should ensure low cost finance for low-carbon heating is available to all households, either by providing loans directly or subsidising commercial loans. The majority of heat pumps are likely to be purchased on finance, and ensuring finance is both widely available and affordable will mean most households can benefit from clean heating. While this is partly a job for the finance industry, there are several ways government policy could support the development of low-carbon heating loans, including:

- providing more confidence in the direction of government policy to help de-risk heat pumps as financial investments
- using the government balance sheet – either via guarantees or the UK Infrastructure Bank – to de-risk and lower the interest rate on low-carbon heating loans
- providing loans more directly to households, either via infrastructure banks or providing capital to private companies.

c) Mandate open monitoring of heating system performance

Besides the electricity to gas prices ratio, the other key determinant of how much a low-carbon heating system costs to run is its efficiency. Well-installed heat pumps typically have Seasonal Performance Factors above three (ie, three units of heat produced per unit of energy used), but many heating systems are less efficient than this, mostly due to lower installation quality. In order to raise efficiency standards, governments should consider a requirement that all new heating systems (including low-carbon heating systems but also fossil fuel systems) are monitored for efficiency using a standardised approach, and that this information is made available to the householder. This monitoring information could be used to identify low quality installations and enable consumers to have installation problems addressed.

3. Expand the low-carbon heating workforce

Alongside increasing customer demand for heat pumps and other low-carbon heating, the low-carbon heating industry also needs to rapidly scale up its capacity. There is currently only a very small number of heat pump engineers in the UK, estimated at around 3,000-4,000. Nesta projects that the number of installers will need to grow by 4,000-6,000 every year until 2035, which is more growth each year than the current size of the industry.

a) Support heating engineers to switch to low-carbon heating

Although there is a large workforce of gas heating engineers that could retrain to install heat pumps, there are barriers in terms of skills, motivation and certainty that make this unattractive to many. Government subsidies for heat pump training courses – which typically cost the Treasury less than £10 million per year in total – can help to bridge this gap. However, gas engineers may need additional support, either in the form of financial payments or advice, because the barriers to switching to heat pumps are much more than the costs of training. Possible policy steps include:

- sending a clear signal on the future role of hydrogen for home heating, to reduce confusion among heating engineers
- committing to pay full training costs and certification costs for the next five years
- providing bursaries for heating engineers who switch to low-carbon heating
- supporting innovative programmes that help heating engineers reorient their businesses to low-carbon heating.

b) Ensure the further education system trains low-carbon heating installers

There are also far too few young people coming through the further education system with the skills to become heat pump installers, and this also needs to increase. Increasing the number of low-carbon heating courses on offer in colleges (working closely with the devolved administrations), and making these more visible and attractive to students should be a priority. Alongside this, further support or incentives to firms to take on low-carbon heating apprentices may be needed.

The UK government and devolved governments should set a target of at least 6,000 people per year getting level three vocational qualifications in low-carbon heating from 2028 onwards. Without this level of new entrants into the industry, the heating workforce will shrink significantly over the next decade as retirements outpace new entrants.

4. Reform planning for electrification

If heat pumps – and electric vehicles – are to be available to most homes, the UK will need to significantly increase its electricity supply (at the same time as decarbonising the electricity system). That means building much more renewable capacity, and planning for more storage or dispatchable energy. As well as increasing the electricity supply, the electricity grid also needs to be significantly upgraded to convey extra electricity to neighbourhoods.

a) Relax planning restrictions on crucial electricity infrastructure

A significant constraint on upgrading the electricity grid is the planning system, which currently makes it a slow and uncertain process to build new grid infrastructure. **The UK government and devolved governments should create special exemptions for grid infrastructure in the planning system, to accelerate grid upgrades.**

b) Secure investment ahead of need in the grid

The current system of grid upgrades is not forward-looking – it is based on waiting for evidence of the need for increased grid capacity before investing in upgrades. Given the lead-in times for grid infrastructure, this approach is not agile enough to cope with the very rapid changes needed to create a net-zero electricity system and electrify the economy. **The UK government should move to an anticipatory system of investment in the grid, investing ahead of need.**

c) Promote local electrification planning

The process of electrifying the UK – rolling out electric heating and vehicles while increasing the electricity supply and grid capacity – will need coordination at a local level. Some examples of this planning are listed below.

- **Heat zoning** – especially for heat networks in city centres and industrial areas. The best approach to low-carbon heating in some areas may be a planned approach where all homes in a neighbourhood switch at the same time.
- **Local grid capacity** – ensuring there is enough grid capacity for electrified heat and transport will require careful local planning, coordinating investment in the grid with uptake of heat pumps and electric vehicles.
- **Local energy infrastructure** – planning for new energy infrastructure, such as onshore wind, solar and grid upgrades, in each local area alongside other infrastructure.

To make this planning work effectively, the government will need to work with local authorities and other bodies, such as the Distribution Network Operators. **The UK government and devolved governments should agree local net-zero transition plans with local areas, which provide resources, powers and guidance in return for planning and delivery of electrification goals.**

d) Overhaul heat pump regulations in the planning system

Heat pumps and EV chargers in homes are also held up by restrictive planning rules, such as the one metre distance from property boundaries, or restrictions in conservation areas and on listed buildings. **The UK government and devolved governments should overhaul the restrictions on heat pumps nationally, and guarantee that all homes will be permitted to install low-carbon technologies by the planning system.**

e) Reform Energy Performance Certificates (EPCs)

EPCs are the most widely used measure of the energy efficiency of homes, but are in urgent need of reform. The following are two particularly pressing issues with EPCs.

1. They do a poor job of reflecting low-carbon heating sources – for example, installing a heat pump can sometimes reduce a home's EPC rating.
2. There are questions over their accuracy in estimating the energy efficiency of homes – they do not involve any actual monitoring of energy consumption.

Given the role EPCs play in both regulation and financial decision-making, the UK government should rapidly improve them to ensure they provide a more accurate measure of homes' energy efficiency and climate impact.

4. Ensuring a fair transition to low-carbon heating

low-carbon heating can be accessible and beneficial for all households provided two conditions are met.

1. Heat pumps have lower running costs than boilers, by making electricity cheaper relative to gas.
2. All households can afford the upfront cost of a low-carbon heating system via affordable finance.

If these two conditions are met, low-carbon heating should be both affordable and reduce energy bills for all households.

Additional measures that may make the transition to low-carbon heating fairer include:

- requiring social and private landlords to install low-carbon heating systems by a fixed date, around 2040
- providing additional support to households with direct electric heating (which is typically associated with higher energy bills) to switch to more efficient heating systems, such as heat pumps or heat networks
- subsidising improved insulation for low income households to further reduce energy bills.

5. Recommendations and further work

1. Commit to a phase-out date for gas boilers

- a. The UK government and devolved governments should confirm a 2035 phase-out date for fossil fuel boilers, and consider an earlier date if a transition is possible in a shorter time period.
- b. The UK government and devolved governments should send a clear, early signal that it expects hydrogen to play a small role in home heating.

2. Make low-carbon heating affordable for all

- a. The UK government should permanently remove the environmental and social levies that are currently added to electricity.
- b. The UK government should set a cap on the electricity to gas price ratio. Ideally this cap would reach 2.5 (electricity costing 2.5 times more per unit than gas), although the cap may need to start higher and gradually move to this level.
- c. The UK government should significantly increase the number of low-carbon heating subsidies available in England and Wales from the current 30,000 per year.
- d. The UK government and devolved governments should ensure low cost finance for low-carbon heating is available to all households, either by providing loans directly or subsidising commercial loans.
- e. The UK government should consider a requirement that all new heating systems (including low-carbon heating systems but also fossil fuel systems) monitor their efficiency, use a standardised approach to doing so, and make this information available to the householder.

3. Expand the low-carbon heating workforce

- a. The UK government and devolved governments should support more gas and oil heating engineers to install low-carbon heating systems, by sending a clear signal on the future of low-carbon heating, funding training and certification costs and providing bursaries to low-carbon heating engineers who retrain.
- b. The UK government and devolved governments should set a target of at least 6,000 people per year getting level three vocational qualifications in low-carbon heating – with an emphasis on quality and hands-on experience – from 2028 onwards.

4. Reform planning for electrification

- a. The UK government and devolved governments should create special exemptions for grid infrastructure in the planning system, to accelerate grid upgrades.
- b. The UK government should move to an anticipatory system of investment in the grid, investing ahead of need.
- c. The UK government and devolved governments should agree local net-zero transition plans with local areas, which provide resources, powers and guidance in return for planning and delivery of electrification goals.
- d. The UK government and devolved governments should overhaul the restrictions on heat pumps nationally, and guarantee that all homes will be permitted to install low-carbon technologies by the planning system.
- e. The UK government and devolved governments should overhaul the EPC system to increase accuracy and better reflect the impact of low-carbon heating.

Further work

This policy plan provides an outline of the approach needed to decarbonise home heating in the UK. However, a number of these policy proposals need to be developed in more detail, and some evidence gaps need to be filled.

Among the questions Nesta plans to do more detailed work on are:

- proposals for improving planning policy for low-carbon heating
- options for the future design of the energy retail market to provide better incentives for electrification
- testing the impact of hydrogen on consumer choices around low-carbon heating
- more detailed work on the most effective financial incentives for people to adopt low-carbon heating
- modelling scenarios for heat pump uptake, to identify potential bottlenecks
- options for monitoring and assuring the performance of heating systems, to help protect consumers.

Endnotes

1. Climate Change Committee, [2023 Progress Report to Parliament](#), p.148.
2. The Climate Change Committee's [2023 Progress Report to Parliament](#) shows Buildings at "Significant Risk" in every category considered.
3. In the Climate Change Committee's Sixth Carbon Budget, the Balanced Pathway shows Residential Energy Efficiency contributing 5.5 MtCO₂e reductions in carbon emissions, out of a total of 70 MtCO₂e reductions required from residential buildings (making eight percent of the total). The Balanced Pathway shows building-scale low-carbon heat reducing emissions by 55 MtCO₂e (74 percent of the total), and low-carbon heat networks reducing emissions by 10 MtCO₂e (13 percent of the total).
4. UK Finance, [Net Zero Homes: Time for a Reset](#), November 2022.
5. Figures from the [European Heat Pump Association](#), quoted in the Climate Change Committee's [2023 Progress Report to Parliament](#), p.148, Figure 5.4.
6. The Department for Business, Energy and Industrial Strategy/Energy Systems Catapult [Electrification of Heating trial](#) found that heat pumps were suitable for all types of housing.
7. Jan Rosenow, [Is heating homes with hydrogen all but a pipe dream? An evidence review](#).
8. Direct electric heating sources are typically capped at an 'efficiency' of one, because they turn electricity directly into heat. Because heat pumps use electricity to draw heat from the air, ground or other source, they can produce more heat than electricity used, typically around three to one.
9. Estimates for total heat pump installations in the UK vary, with the Climate Change Committee putting 2022 domestic installations at 69,000 and the European Heat Pump Association estimating it at 55,000.
10. Source: Heating and Hotwater Industry Council figure for the 12 months to April 2021.

11. UK Government, [Clean heat market mechanism consultation](#), 2023.
12. Chris Skidmore MP, [Review of Net Zero](#).
13. Nesta, [How to reduce the cost of heat pumps](#), 2022.
14. Nesta, [How to reduce the cost of heat pumps](#), 2022.
15. Nesta, [How to increase the demand for heat pumps](#), 2022.
16. Nesta, [How the energy crisis affects the case for heat pumps](#), 2022.

The logo for Nesta, consisting of the word "nesta" in a white, lowercase, sans-serif font, positioned in the top right corner of a blue background.

nesta

A large, abstract geometric pattern made of white and green shapes, resembling a stylized maze or a series of interconnected paths, set against a blue background.

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