The Future of Residential Heating in Britain

July 2023

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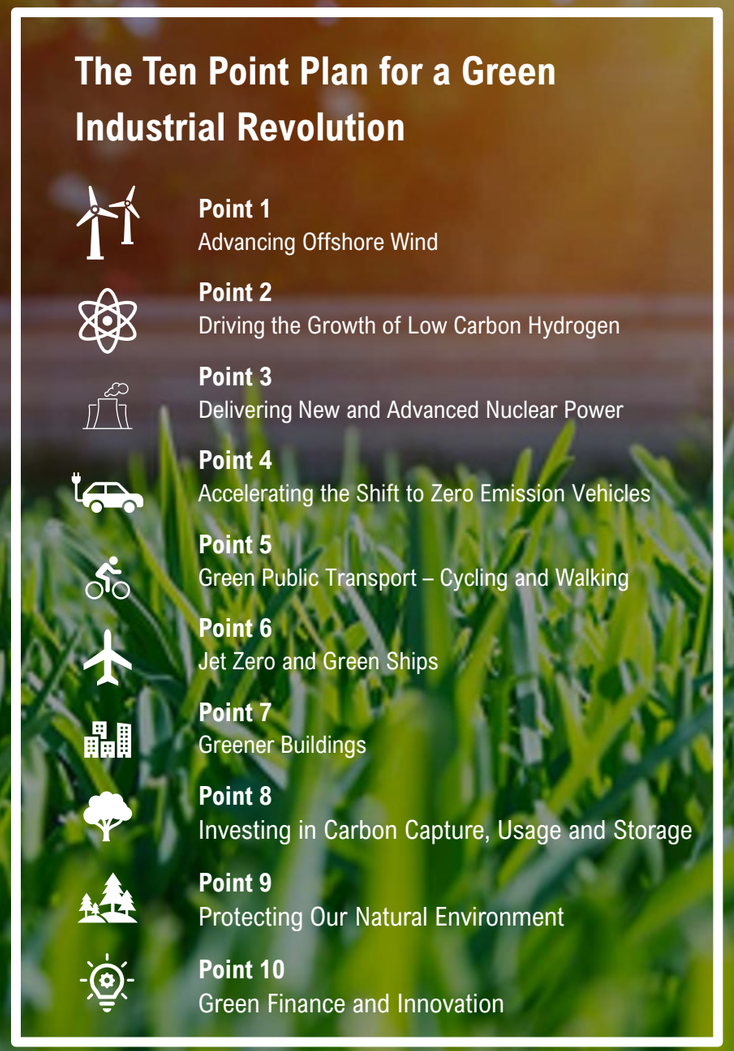
IMAGE 1. The Ten Point Plan for a Green Industrial Revolution [6]



8 in 10

Britons believe the government holds a significant level of responsibility for lowering carbon emissions[8].

The British transition to Net Zero

There is strong public support for the UK Government's commitment to Net Zero, with the majority of Britons (66%) in agreement that if the government does not tackle climate change now, it will be failing its citizens[8]. Although the UK has sanctioned its commitment to addressing climate change legally, including the Climate Change Act 2008 and the legally binding 2050 target to achieve Net Zero, there is still much to be done[2].

The UK's Ten Point Plan unveiled in 2020 was intended to serve as the roadmap for a transition to Net Zero and the green industrial revolution[6]. A critical component of the Ten Point Plan is a focus on renewable, low carbon energy sources.

Both the UK Government and the Climate Change Committee (CCC) have recognised the imperative for the UK achieving Net Zero. The CCC's Sixth Carbon Budget offers Ministers advice on the volume of greenhouse gases (GHGs) the UK can emit during the period 2033-2037. This decade is critical to ensure the proper protocols and strategies are in place to meet these targets.

The UK has some of the least energy efficient housing in Europe, making green homes initiatives a critical component of the government's Net Zero agenda [9]. As part of this goal, the government has committed to install 600,000 heat pumps by 2028[22].

However, it has yet to officially commit to decarbonise residential heating through legislation, although industry widely considers 2026 to be a critical date to achieve Net Zero targets. To achieve these targets, legislation must focus on reducing consumer energy usage first and foremost. A second priority would be to introduce provisions to help consumers use energy more efficiently through technologies like heat-pumps.

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Cost and complexity are the central hallmarks of a long list of unsuccessful UK Government Green Initiatives:

GREEN DEAL – launched in 2013 as a scheme to help homeowners make energy efficient improvements. Scrapped in 2015 for being too complicated and expensive.

CARBON CAPTURE & STORAGE (CSS) – The UK Government planned to invest in CCS technology, but the plan was scrapped in 2015 due to concerns about cost and technology. This position has now been reversed again – as of April 2023.

ZERO CARBON HOMES – introduced in 2006 to ensure all new homes built from 2016 onwards would have net-zero carbon emissions but was scrapped in 2015 due to high costs of implementation.

FEED-IN TARRIFFS (FITS) – launched in 2010 to encourage adoption of small-scale renewable energy technologies e.g., solar panels and wind turbines – but scrapped in 2019 due concerns around high costs.

RENEWABLE HEAT INCENTIVE (RHI) – launched in 2011 to encourage adoption of renewable heating technologies such as biomass boilers and heat pumps but closed to new applicants in 2021 because it was deemed too complicated and expensive.

The UK Government must move beyond good intentions

Despite efforts, the UK Government has faced considerable challenges in the green homes space that have left both able-to-pay consumers and industry professionals alienated and disillusioned.

Currently, residential heating in Britain relies on several different technologies, including fossil fuel (e.g., gas and oil) boilers, hybrid boilers, hydrogen-ready boilers and heat pumps. Gas boilers will likely be phased out in the next decade, but a key government decision is still to be made on which technology will be chosen to lead the decarbonisation of residential heating: hydrogen-ready boilers or heat pumps?

The government has mandated that all new domestic gas-boilers will need to be “hydrogen-ready” by 2026, although there is no guarantee that these boilers will actually be converted to hydrogen gas. A decision will then follow on whether UK residential heating will rely more on heat pumps or hydrogen boilers. If the 2026 deadline were brought forward it would expedite industry confidence to invest in supply chains and ensure benefits of a carbon neutral transition.

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A new study to inform decarbonisation of homes

Mitsubishi Electric and Ipsos partnered on this study to bring to light new information and help to inform policy and legislation on green homes. The study involved a policy and insight audit, interviews with energy policy experts and an online survey of 1,000 people that were 16-75 and nationally representative. The survey ran from 19-21 May 2023. Key Findings of the study include:

- 34% of Britons don't know the most environmentally-friendly way to heat their homes
- 32% of Britons say they would be most likely to get trusted advice on household decarbonisation from the UK Government website
- 41% of Britons agree that government should have a deadline for decarbonisation of the economy
- 55% of Britons want the cost-of-living crisis to be a priority on the government's agenda

The Great Hydrogen Debate

Proponents of hydrogen argue it has significant potential as a clean energy source specifically for carbon-intensive industries where electrification is not feasible or considerably challenging. This includes heating buildings and homes.

While it may have a place in industrial settings, hydrogen is an inefficient use of energy in residential settings[21] and the technology is too far off relative to more readily available technologies like heat pumps.

Hydrogen is widely acknowledged as a renewable energy source, but varying production methods means it's not guaranteed to be a low carbon energy source.

Hydrogen production methods result in three different formats:

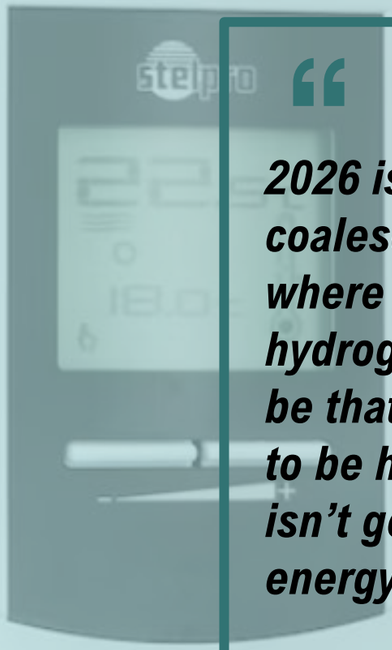
GREY HYDROGEN. Carbon emissions from production are not captured.
BLUE HYDROGEN. Carbon is captured and stored.
GREEN HYDROGEN. Renewable energy sources like solar or wind power are utilised in the production process[27].

Hydrogen indecision stalls effective planning, confidence and investment

The infrastructure for carbon capture and storage isn't yet adequate and will incur both significant development costs and emissions. Producing hydrogen also requires a huge amount of electricity which is not fully available through the electricity grid; the required capacity must come from nuclear energy according to a recent Aurora Energy Study[23].

Any electricity used for producing hydrogen for residential heating would be used more efficiently if directed straight to heat pumps. For these reasons, the experts we spoke to felt hydrogen was unlikely to be feasible to integrate it into Britain's residential energy mix in the future.

There's a strong sense of uncertainty around the direction that will be taken when it comes to decarbonising residential heating, particularly when it comes to the role of hydrogen and which energy source will be favoured in the future. Given the confusion around the government's priority energy sources, many businesses, installers and local governments are less able to effectively plan long-term. This impacts recommendations they then provide to end-consumers.



> ***2026 is the big date that everything coalesces around. It's the date where new gas boilers need to be hydrogen-ready. However, it could be that despite gas boilers needing to be hydrogen-ready, hydrogen isn't going to be in the British energy mix moving forward.***
>
> *- Ipsos Energy Expert*

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In order to produce 70GW of residential heating energy from green hydrogen as an initial source would require an estimated 150GW of renewable electricity. By contrast, to receive the same 70GW from a heat pump for residential heating, would require just 26GW of electricity, making it a much more energy efficient energy source.

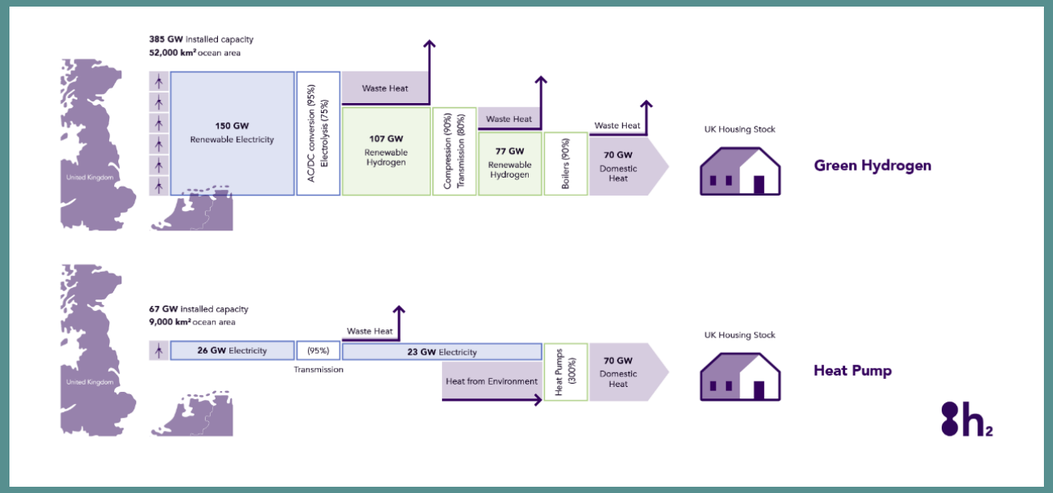

IMAGE 2. Heating the UK with Heat Pumps or Green Hydrogen[21]

Heat pumps have emerged at the heart of the home decarbonisation movement

Capable of providing up to 3x more energy than they consume, they are considered more energy efficient and less carbon intensive than gas boilers.

These energy efficiency advantages of course come with the co-benefit of cost savings for end consumers. Heat pump technology allows for highly energy efficient residential heating, as for every kW of electricity consumed, a heat pump can produce 3kW of heat energy while a gas boiler produces less than 1kW of heat energy[28]. Therefore, around two thirds of a heat pump's energy output comes from natural sources, with the remainder coming from the electricity grid. This further reduces a heat pump's carbon footprint, in stark contrast to carbon-intensive hydrogen production which still relies on fossil fuels[12].

Being highly energy efficient means cost savings should come as a core benefit of heat pump adoption. The cost-of-living crisis and fuel security concerns amidst the Russia-Ukraine war are imposing considerable challenges on British consumers today, and increasing reliance on heat pumps should contribute to mitigating these concerns.

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2 in 3

Britons think the worst of the cost-of-living crisis is still to come [20]

3 in 10

cite fossil fuel security concerns as a driver for installing heat pumps [26]

Cost-of-living crisis has potential to drive heat pump adoption

Despite potential running cost savings, it should be noted that up-front capital requirements are higher for heat pump installation than gas boilers and the significance of this deterrent is explored below.

There are significant market forces driving heat pump demand. Housing associations take interest in heat pump adoption because transitioning away from gas heating is beneficial for fuel-poor households, in pursuit of a just transition. By just transition we refer to a transition to Net Zero that leaves no one behind. Ninety-seven per cent of households participating in Green Home Grant Voucher Schemes (GHGVS) and ECO3 Scheme were classed as low-income, suggesting that these provide an opportunity for fuel-poor households to both improve their energy efficiency and tackle cost-of-living challenges[18].

New builds are also critical for market growth, arguably being easier for a new build design to incorporate a heat pump than retrofitting a household designed with a gas boiler in mind. However, developers are awaiting building regulation updates from government to incorporate decarbonised heating in future developments.

There's also broad appetite for heat pump installation amongst end consumers with 42% of Britons having some interest in installing a heat pump. The biggest motivation is the potential to save on energy bills[26].

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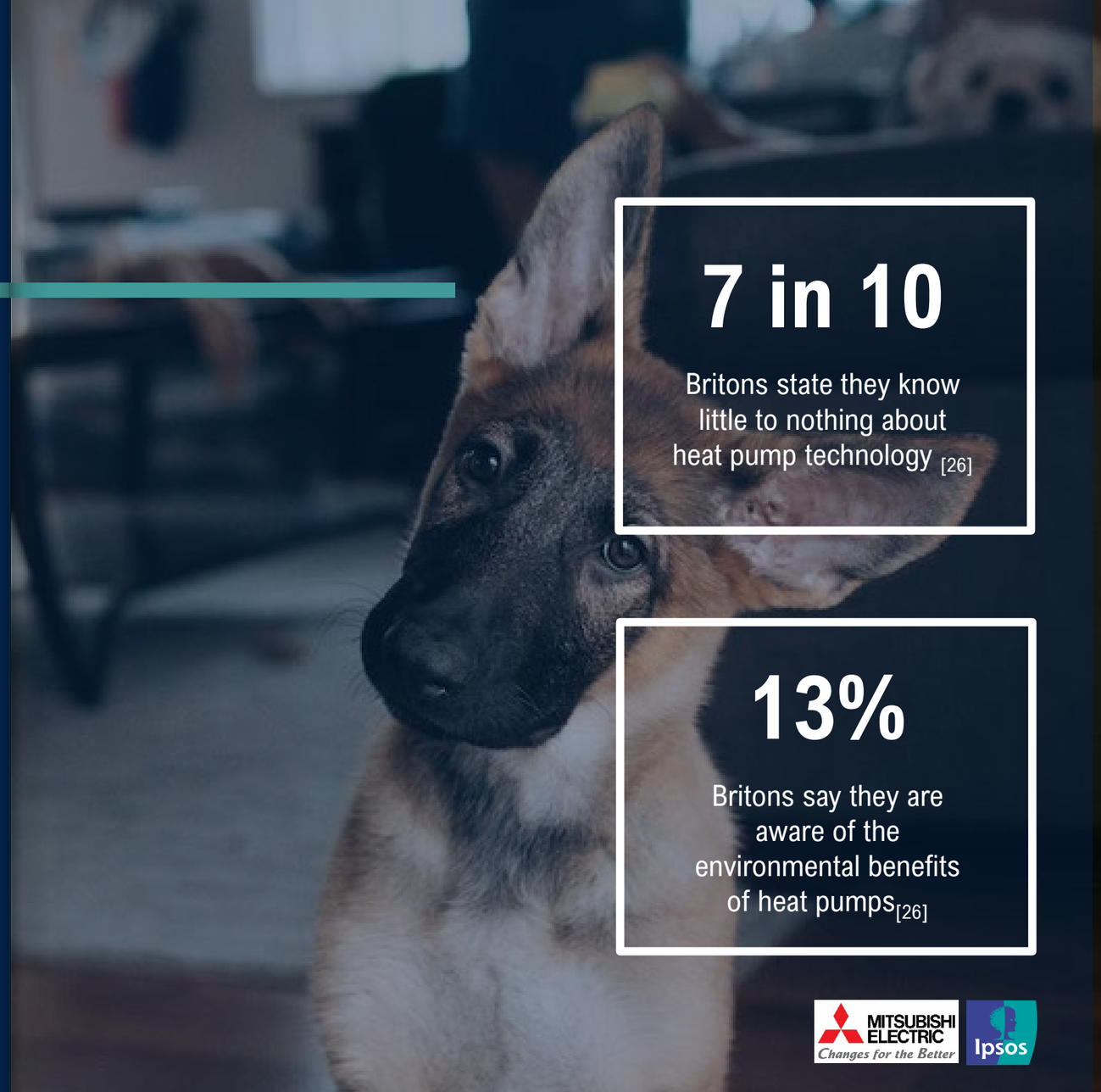
Awareness remains a critical barrier for heat pumps

Britain is still in the early adoption phase for heat pumps and as such, they are not yet considered an established technology by most British consumers. As with most technologies in the earlier stages of adoption and maturity, there's a lower level of trust in their reliability, and being an early adopter is often perceived to be riskier.

New builds, housing associations and individual consumers each represent roughly a third of the current heat pump consumers[Mitsubishi Electric sales data].

Given there are 28.2 million households in Great Britain, this puts individual consumers slightly behind industry when it comes to heat pump adoption. However, they could represent a significant portion of demand if targeted properly with effective communication and funding strategies to remove the barriers to adoption that currently exist.

The first hurdle to tackle is awareness. Today, public awareness of the arguments for heat pumps is low, and there are no reliable, widely trusted sources of information from which to learn about them.



7 in 10

Britons state they know little to nothing about heat pump technology [26]

13%

Britons say they are aware of the environmental benefits of heat pumps[26]

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Significant confusion exists around heat pumps' tangible benefits

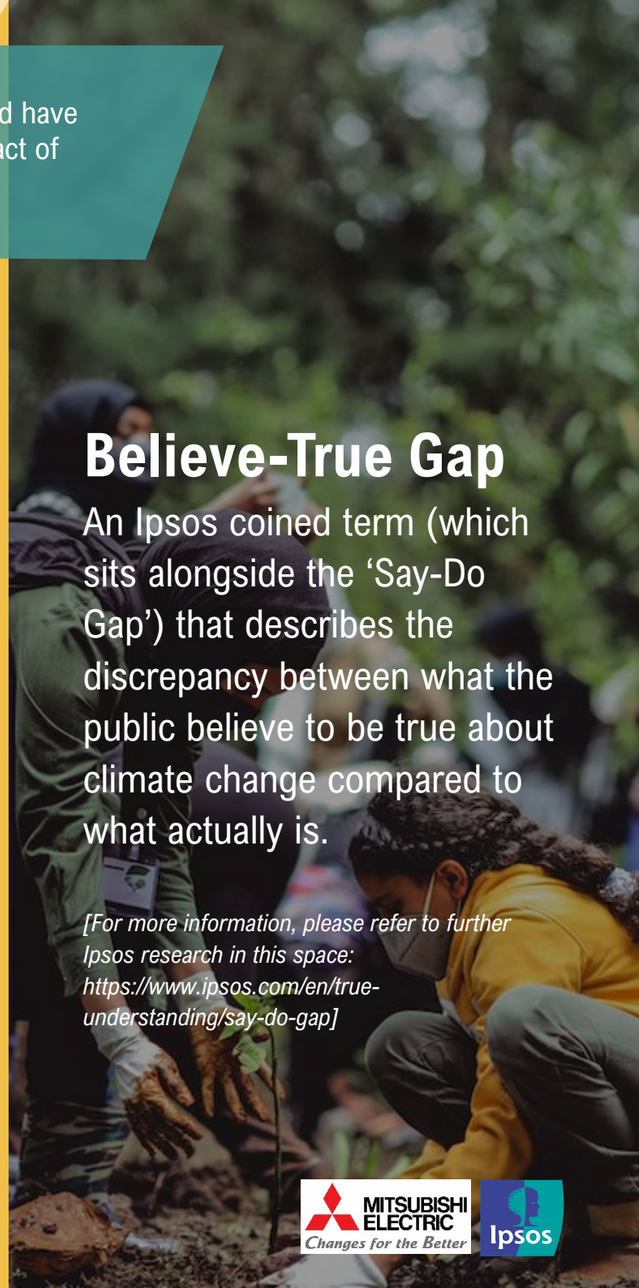
The public's understanding of the most impactful actions they can take to reduce their environmental footprint is also limited, with more than one in three saying they don't know the most environmentally friendly ways to improve their energy efficiency[26]. The existence of what Ipsos have termed a 'Believe-True' gap is clear: consumers overestimate the impact of actions that require minimal behaviour change – such as installing more efficient home appliances or using appliances in a more environmentally-friendly manner – and underestimate the impact of more significant actions, such as using only renewable electricity. Installing a heat pump was one of the most significantly under-appreciated behaviour changes by consumers.

It is therefore important that energy efficiency is taken into consideration at the conception of a building's development process, rather than an afterthought or 'bolt on' to meet requirements. This is effectively called a 'fabric first approach' and reduces the need to address complex challenges like consumer behaviour change.

Which of the following actions do you think would have most impact on reducing the environmental impact of homes?[26, Q1]

	Perceived Ranking	Actual Ranking[29]
More efficient home appliances	1st	7th
Using appliances in a more environmentally friendly manner	2nd	8th
Renovating home to improve insulation	3rd	2nd
Using only renewable electricity	4th	1st
Reducing hot water usage	5th	5th
Installing a smart meter for gas & electricity	6th	6th
Installing a heat pump	**7th**	**3rd**
Living in smaller spaces	8th	4th
Installing a green (living) roof	9th	9th

Perceived Ranking: n=1,000 British adults, aged 16-75, interviewed online, 19-23 May 2023



Believe-True Gap

An Ipsos coined term (which sits alongside the 'Say-Do Gap') that describes the discrepancy between what the public believe to be true about climate change compared to what actually is.

[For more information, please refer to further Ipsos research in this space: https://www.ipsos.com/en/true-understanding/say-do-gap]

Sustainability is a co-benefit, not the driver of uptake and engagement

In today's 'polycrisis' world, consumers are bombarded with conflicting messaging and are confronted by a cost-of-living crisis, climate crisis, war and fuel security concerns. Most have competing need-states in which the most immediate threats (often financial or health) take precedence over longer term, global issues like climate change.

Fundamentally, consumers need reliable, cost-effective heating systems that keep them warm. They tend to prioritise essential needs when it comes to making purchase decisions, meaning sustainability sits towards the bottom of purchase considerations for most consumers[26].

We found that more than half of Britons (55%) agreed that dealing with the cost-of-living crisis should be prioritised over residential heating decarbonisation and household energy efficiency. Only 17% agreed the opposite, showing that despite widespread support for tackling the climate crisis, in practice, sustainability concerns can't compete against more pressing concerns[26].

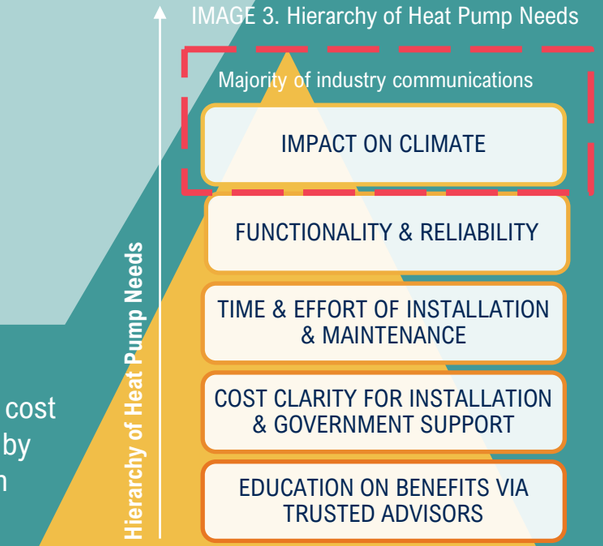
Despite this clear hierarchy of needs showing that sustainability is not enough of a purchase "hook", a significant amount of industry messaging to consumers on heat pumps focuses on environmental sustainability as being a key reason for installation.

Government and industry need to carefully evaluate the positioning of heat pumps and ensure messaging, communications and services speak to four main features of consumers' needs: Costs, Convenience, Functionality and Reliability. Sustainability positioning would be more effective if it featured as a conduit to these needs (e.g., being cheaper over time given energy savings).

The bulk of the population will not find the environmental appeal of heat pumps enough to be motivated to upgrade their homes. The number of consumers who choose to upgrade their homes with sustainability as the key motivation are in the minority. This means that sustainability should be presented as an additional co-benefit alongside the fundamental consumer needs, to provide further motivation for heat pump purchase. A fabric first approach is one that reduces the primary energy usage needs first and foremost through a focus on energy usage in the initial development of the building. This will be key as it lessens the burden on consumer behaviour change.

Evidence shows repeatedly that functionality, cost and installation considerations are prioritised by consumers over environmental benefits when making purchase decisions in the residential heating space. Despite this, a significant proportion of industry communications are centred on the environmental benefits of heat pumps.

IMAGE 3. Hierarchy of Heat Pump Needs



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A trust vacuum exists for consumers looking to develop their understanding of heat pump technology – there's no established, network of advisors

Only 41% of Britons regard the government to be trustworthy when it comes to leading the fight against climate change – among the least trusted of all sources, alongside businesses. This is despite 80% agreeing that the government has a responsibility to act to reduce carbon emissions[26].

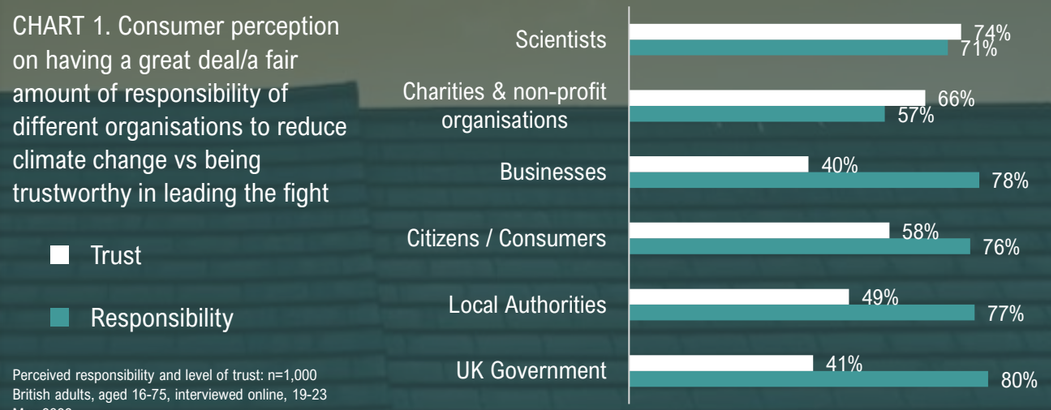
When it comes to finding trusted information for consumers looking to improve their understanding of heat pump technology, the UK Government [32%] is the source consumers are most likely to engage with for advice on heat pumps[26]. This means the onus is on government to provide an engaging approach to advising consumers on the low carbon transition[30].

Other sources consumers would turn to include heat pump manufacturers themselves [24%], local authorities [23%] and installers [23%]; though given the low level of heat pump installation capability in Britain, many of the installers may have an inherent preference for hydrogen-ready boilers[26]. The issue of installation capacity will be explored below.

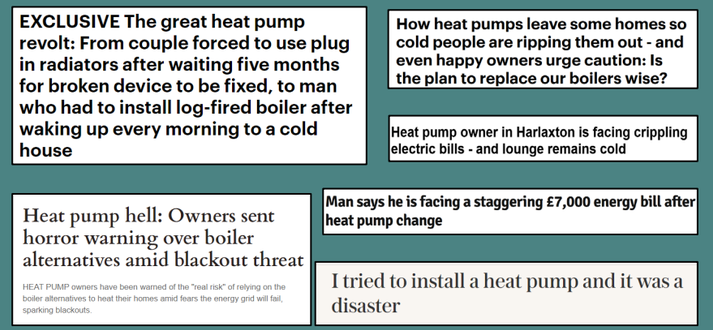
While word of mouth recommendations [21%] from friends and family are similarly trusted by consumers, in the case of heat pumps, uptake to date is still too low for this channel to be widespread enough to significantly drive adoption[26].

The British media is the least trusted source of heat pump information [9%]. There's a skew in the media towards "scare stories" and potentially overstated reporting, which may foster a lack of trust amongst consumers.

CHART 1. Consumer perception on having a great deal/a fair amount of responsibility of different organisations to reduce climate change vs being trustworthy in leading the fight



Perceived responsibility and level of trust: n=1,000 British adults, aged 16-75, interviewed online, 19-23 May 2023



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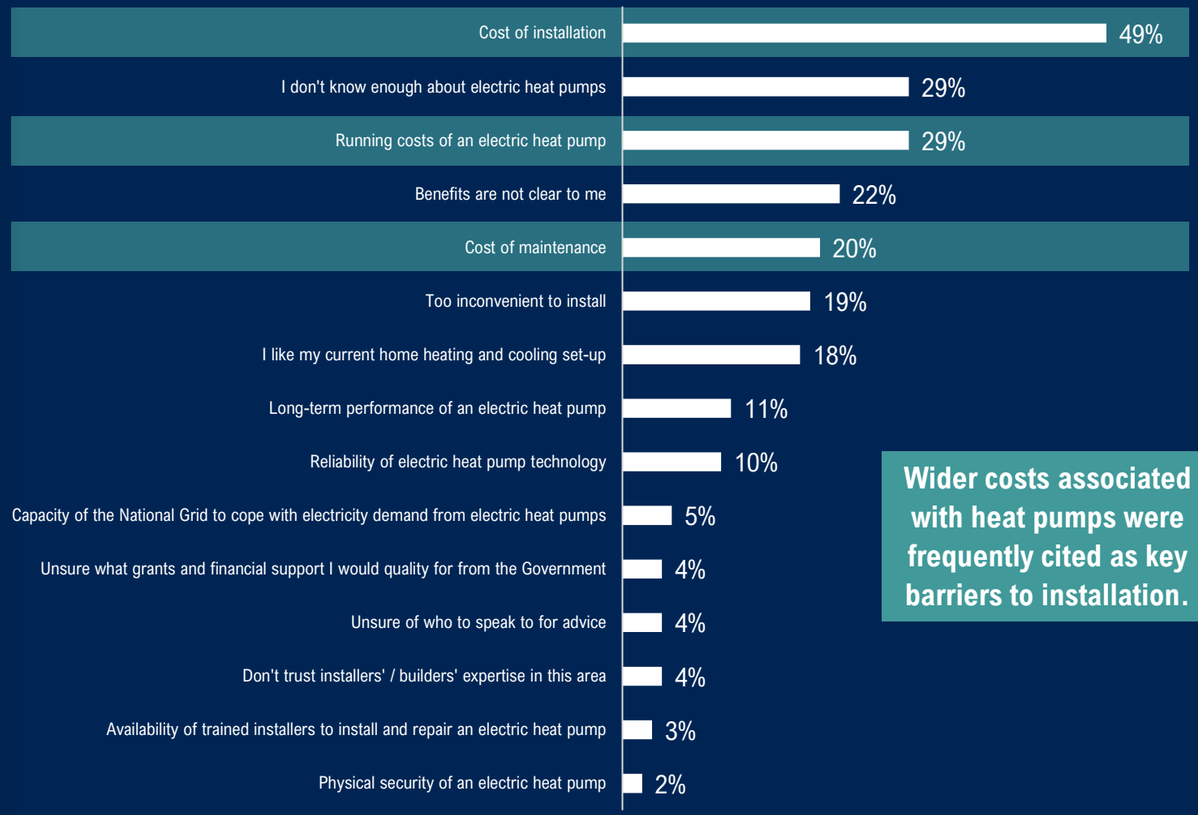
Perceived costs of installation are the number one barrier to uptake.

Additional concerns and confusion exist for able-to-pay consumers around heat pump suitability, performance, disruption, and cost, all of which are major barriers for adoption.

By a significant margin, installation costs were the biggest barrier to heat pump installation for consumers. The UK Government's Heat Pump Ready Programme consultation showed that even just the upfront cost of heat pump installation was beyond what most participants were willing to pay, even after considering current levels of grant funding[3]. Some consumers felt that the level of government support provided was insufficient to generate high levels of uptake, feeding into scepticism around the strength of government ambition.

Further cost concerns related to additional payments for broader home upgrades such as insulation upgrades and radiator replacements required to make a household suitable for a heat pump, as well as confusion around exactly what costs would be covered by the Boiler Upgrade Scheme.

CHART 2. Which of the following, if any, would you say are the main reasons you are not interested in installing an electric heat pump in your property?



Wider costs associated with heat pumps were frequently cited as key barriers to installation.

Base: 1,000 British adults, aged 16-75, not interested in installing a heat pump, interviewed online, 19-23 May 2023

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Addressing infrastructure barriers and installer capacity is critical for successful heat pump adoption

There's currently a significant gap between the number of trained installers that would be required to facilitate the meeting of government's annual heat pump installation target and the current level of capacity to do so. This is despite more than half (56%) of installers saying they're interested in heat pump installation training in the next 12 months[24].

For those who aren't interested in training, the barriers are likely to be two-fold. Firstly, age: for those closer to retirement, there's little incentive to reskill. For others, it's likely to be a matter of understanding of the hydrogen-heat pump debate: the transition from traditional to hydrogen boilers would require a lower additional training threshold given the closer similarity between gas and hydrogen boilers compared to heat pumps. As a result, the perception of many in the industry is that this would be the easier transition to make.

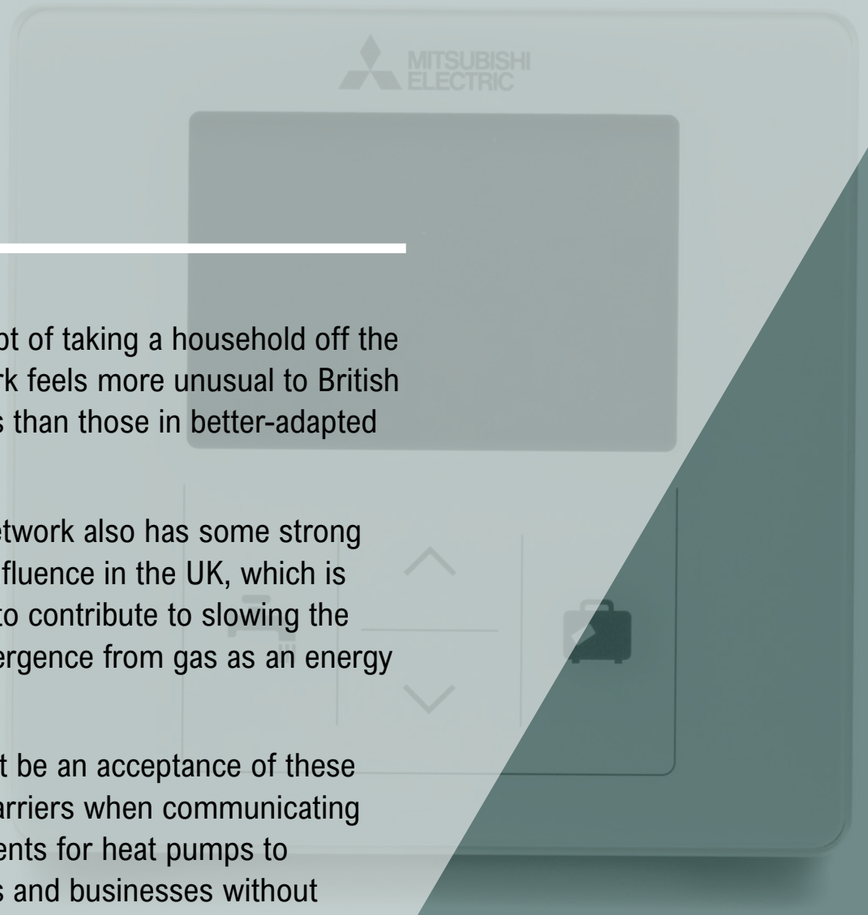
The legacy gas network is also holding Britain back from transferring away from gas as an energy source and adopting heat pumps en masse.

As an economy built around a gas energy infrastructure, the barriers to divesting from gas are inherently higher than in markets with less historical reliance on gas networks, as in the Nordics.

The concept of taking a household off the gas network feels more unusual to British consumers than those in better-adapted markets.

The gas network also has some strong lobbying influence in the UK, which is also likely to contribute to slowing the rate of divergence from gas as an energy source.

There must be an acceptance of these inherent barriers when communicating the arguments for heat pumps to consumers and businesses without deterring heat pump adoption.



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Recommendations for government

1. **A NUMBER OF REGULATORY & FINANCIAL LEVERS SHOULD BE PULLED TO SCALE HEAT PUMP ADOPTION.** From both a business and consumer perspective, there's a need for government to set out in more detail how high-level heating decarbonisation legal deadlines will be met as there is currently a lack of clarity on how this will be done. This includes making a clear decision on the preferred energy source for residential heating as early as possible. Looking at current progress, heat pumps are overwhelmingly likely to be the favoured source. This will allow businesses to plan better and able-to-pay.

   Given the impact of the cost-of-living crisis on consumers' willingness and ability to invest in more sustainable technologies, there's a critical need for comprehensive government support. Policy aimed at encouraging installation amongst able-to-pay consumers should focus on simplifying funding and reducing the wider cost barriers to choosing heat pumps over gas boilers.

   Decoupling electricity prices from gas prices in Britain will incentivise behaviour change towards electrification and more renewable forms of heating by disassociating electricity from gas price volatility. Currently, passing the cost of green levies on to electricity over gas provides a disincentive to shifting to greener energy sources.

2. **MOVE DECISION DATE CLOSER.** A 2026 decision date is too late for the UK, we need urgent action to provide confidence for industry to build infrastructure and drive investment. The UK Government should act swiftly to deploy low carbon heating and energy efficiency measures to meet the 600,000-heat pump per year target by 2028. Delayed decision-making has stalled local authorities, installers, and housing associations on whether to move forward with their decarbonisation strategies. Given that 2026 will be a pilot for initial trials, there is a significant risk in further delayed decision-making as a result.

3. **TARGETED UPSKILLING, CAPACITY BUILDING & INFRASTRUCTURE INVESTMENT SHOULD BE CRITICAL PRIORITY AND START NOW.** To bridge the capacity gap between the number of installers trained today and the number required to facilitate the meeting of the government's annual target of 600,000 heat pump installations by 2028, there needs to be a concerted effort to provide funding for such training, as well as engagement with tradespeople on how available training can be accessed and the individual benefits of doing so. Engaging with tradespeople on the arguments for heat pump installation, as well as the individual benefits of upskilling in this area, installers will be better able to provide impartial, accurate advice to consumers on the best purchase decisions for them to decarbonise their home heating.

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Recommendations for Government

4. **UK GOVERNMENT MUST PROVIDE CLEAR COMMUNICATIONS TO DRIVE AWARENESS & UNDERSTANDINGS VIA A NETWORK OF TRUSTED ADVISORS.** When it comes to advice on sustainable behaviours more broadly, and heat pumps specifically, British consumers require impartial advice; over a third of Britons want easy access to information on the daily steps they can take to be more sustainable[8]. As the source consumers are most likely to turn to first for advice on sustainable heating, the UK Government has a leading role to play in driving consumer education in this space, be it through improved insulation, heat pumps or other steps.

   Targeted communications for able-to-pay consumers should address key barriers and promote the core drivers for heat pump installation, rather than simply relying on sustainability as the presumed purchase driver. Doing so simply, accurately and convincingly is essential for government to overcome the trust vacuum that exists.

   Particularly given the impact of the cost-of-living crisis on individuals' ability and willingness to invest in sustainable technologies, there's also a need for the government to provide clarity on the level and coverage of support available.

   As consumers tend to look to local authorities, heat pump manufacturers and installers as first ports of call, it's important that the UK Government engages with and disseminates information to each of these actors to create a network of trusted advisors' consumers can rely on for accurate advice.

41%

of Britons agree that there should be a deadline for the decarbonisation of residential heating within the next decade[26]

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Case Study: Home Energy Scheme in Scotland

Learnings from other government schemes, largely focusing on education, simplicity of user experience and cost-effectiveness (value) must be considered to ensure the various initiatives and funding sources aimed at decarbonising residential heating achieve the most significant uptake and impact possible.

There is potential to replicate Home Energy Scotland scheme, an independent body funded by the Scottish Government, across England and Wales.

This scheme allows consumers to call and get independent advice about home energy and heating queries. Partnerships with existing trusted bodies to help provide this advice should also be explored.

Appendix

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2. Heat Pump Net Zero Investment Roadmap, 2023, Department for Energy Security and Net Zero

3. Heat Pump Ready Programme, 2021, Department for Energy Security and Net Zero, Department for Business, Energy and Industrial Strategy

4. A market-based mechanism for low-carbon heat, 2022, Department for Business, Energy and Industrial Strategy

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7. UK Hydrogen Strategy, 2021, HM Government

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11. Russell Dean interview, 2023, Energy Digital Magazine

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Thank you.
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