

Written evidence submitted by E3G (DHH0124)

About E3G

E3G is an independent, not-for-profit climate change think tank. E3G has been engaging on issues of energy system decarbonisation for over 15 years and has expertise on areas including green and sustainable finance, energy efficiency and zero carbon heat, as well as political economy and governance. Evidence submitted reflects these areas of focus and specialisation. E3G is secretariat for the Green Finance Institute's Coalition for the Energy Efficiency, which has recently launched a Zero Carbon Heating Taskforce.

Summary of key points

Heating buildings accounts for 21% of the UK's greenhouse gas emissions,¹ second only to transport, and currently represents a major shortcoming in the country's decarbonisation goals. Climate science is clear that significant progress must be made in the next 10 years to get on track to limit the global average temperature rises to 1.5C – globally cutting carbon emissions by 45% between now and 2030.² This represents a huge challenge for the heat transition – but also an enormous opportunity for the UK to race to the top, supporting a long-term green recovery across the UK, boosting green jobs, manufacturing and supply chain. The target set out in the Prime Minister's 10-Point Plan to install 600,000 heat pumps per year by 2028 represents a welcome step-change from current levels of deployment, this will need to be supported by a comprehensive long-term policy framework and finance strategy to turn words into action.

The below key points are numbered to correspond to the terms of reference for the inquiry:

1. The UK needs to **rapidly accelerate action** on heat decarbonisation in order to get on track to meet its 2050 climate target and interim carbon budgets. While the inclusion of heat pumps within the Green Home Grant is a welcome foundation to build upon, a more ambitious long-term plan and finance strategy is required in order to come in reaching distance of the newly announced target to install 600,000 heat pumps per year by 2028. The current slow pace of heat decarbonisation falls far behind what is needed to get on track for net-zero, with the UK currently trailing near the bottom of the heat decarbonisation league table – with much to learn from European neighbours.
2. The Heat & Buildings Strategy is a critical opportunity for the UK to set a **long-term framework and roadmap**, outlining how the UK will decarbonise its building stock. E3G has engaged with expert stakeholders from across the energy sector, local government and finance to establish a set of principles which should underpin the government's approach. This should include that the plan must be transparently **aligned with the net-zero target and carbon budgets**. It must emphasise the **need for speed**, moving rapidly to deploy solutions that are available and scalable today to help establish a mass market for smart, efficient electric heating by the end of this decade. Third, the plan must place **consumers at its heart**, providing advice, protection and access to all. Fourth, it needs to embed **fairness**, with costs and benefits distributed to foster inclusivity that accelerates mass deployment. It needs to **level the playing field** in support of zero carbon heating options, ensuring the economics favour low carbon rather than fossil fuel heating systems. Finally, all this

¹ BEIS (2018) Clean Growth – Transforming Heating: Overview of Current Evidence

² IPCC (2018) Global warming of 1.5°C

needs to be embodied in a **coherent national framework that unleashes private sector and local leadership** for rapid deployment.

3. New, consolidated academic research by UKERC finds **energy efficiency, heat pumps and district heating** comprise the most effective investment pathway for heat decarbonisation for the next 10 years.³ It is deployment of these measures that E3G recommends the government must scale within this Parliament, in order to get on track to meet climate targets and interim carbon budgets. **Green hydrogen for heating is not a viable near-term option** for most of the country, and mass deployment of blue hydrogen, owing to fugitive CO₂ and methane emissions, will not be compatible with a zero-carbon approach.
4. There are a number of major hurdles that currently stand in the way of a rapid decarbonisation of heat. Perhaps the greatest barrier is that currently, the easiest option for homeowners is inaction – and this is what the vast majority do. Addressing **consumer passivity** will be a key challenge to unlock greater action and investment. Another major hurdle is the **high upfront costs** associated with zero carbon heating options, particularly in comparisons to fossil-gas systems. Addressing these two barriers will require significant regulation and support with capital costs. The **economics of heat favours fossil fuels**, with sunk costs in gas infrastructure and inertia among incumbents. **A lack of long-term policy certainty and funding** undermines business and investor confidence in investing to scale up skills and supply chains, meaning that costs remain high and innovation low. **Awareness is low along the value chain** – with households, financial providers, Local Authorities and installers often lacking awareness of zero carbon heating options and pathways. E3G offers suggestions which could help address these hurdles.
5. Resources should be allocated on the basis that they aim to **minimise total system costs**, thereby maximising value for all consumers. This means following the **heat hierarchy**, with energy efficiency first and direct energy sources reserved for needs that cannot be met cost-effectively through waste heat recovery or upgrading heat. Costs should be implemented via a **new governance framework** that ensures the use of consistent and up to date technical assumptions and whole system planning.
6. Action is required to ensure that **households are engaged, informed, supported and protected during the transition** to low carbon heat, with **engagement and education** provided through national and local government, across the heat value chain. This includes households, Local Authorities, regulators, installers and service companies, financial institutions among other stakeholders.
7. While certain policy decisions are necessary at a national level, the resulting framework must empower and mobilise action at a local level. There should be **flexibility for different approaches** that are most cost-effective locally, within a coherent national framework. This should encourage **local leadership in social housing and public buildings**, complemented by **heat ‘zoning’** and a **heat hierarchy** that incentivises innovation and investment, accompanied by a **heat Sector Deal** to secure lasting economic benefits for the UK.

1. What has been the impact of past and current policies for low carbon heat, and what lessons can be learnt, including examples from devolved administrations and international comparators?

³https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/09/The_pathway_to_net_zero_heating_UKERC_briefing.pdf

To date, past and current policies in the UK have failed to put the country on track to decarbonise its heating systems at a pace necessary to meet decarbonisation goals. **Heat decarbonisation is one of the main credibility gaps in the UK's net zero ambition.** Six times more customers are being connected to the gas grid each year than took up low carbon heating in 2019. Climate science is clear that significant decarbonisation progress must be made in the next 10 years to get on track to limit the global average temperature to 1.5C – globally cutting carbon emissions by 45% between now and 2030⁴ – which demands decisiveness and speed. There are only two heating system replacement cycles between now and 2050.⁵ The UK is on course to miss its 2020 targets for heating and cooling emissions reductions, achieving 7.5% reductions from 1990 levels (as of 2018) vs. target of 12% by 2020. Approximately 85% of homes and 65% of non-domestic buildings are still heated by natural gas in the UK.⁶ Less than 2% of heat pumps and 37% of heat networks that are needed are being installed each year.⁷

Several policies have been advanced by UK government to support low carbon heating systems, but their effect has been much lower than what is required. For example, the development of heat networks is currently being pursued in dense urban areas, mainly in new developments, and is supported by the Heat Networks Investment Project (HNIP),⁸ coordinated by the Heat Networks Delivery Unit. The Renewable Heat Incentive (RHI) has supported the deployment of heat pumps, biomass boilers and solar thermal systems mostly in commercial buildings and rural, off-gas homes as well as the injection of biomethane, mostly from anaerobic digestion, into the gas grid. The RHI recorded approximately 11,000 installations in 2019,⁹ contrasting sharply with 60,000 customers connected to the gas grid each year.¹⁰

A step-change in approach is required to turn this climate roadblock into a launchpad for a net-zero aligned green recovery. Inspiration can be taken from other countries around the world who are also working to decarbonise their heating systems. For instance, **many countries are signalling the end to fossil fuel heating systems through banning installations of gas into new build housing** – with legislation requiring this introduced in the Netherlands in 2018.¹¹ France has recently announced that the new RE 2020 regulations will ban gas in new homes from 2021, with a ban that will affect new collective housing coming into place from 2024.¹² Other policy tools have also been successful: in Sweden, fossil heating fuels are being phased out through a **carefully crafted carbon price**, with emissions subsequently dropping 85% and now representing just 2% of Sweden's total greenhouse gas emissions.¹³

Looking to **devolved nations**, the Scottish Government's programme for 2020/21 announced nearly £1.6bn over the next Parliament to ensure "that emissions from heating are eliminated by 2040" and end "poor energy efficiency as a driver of fuel poverty".¹⁴ The Scottish Government has set the ambition to at least double the rate of renewable heat installations in new and existing homes and buildings every year. Their ambitions in renewable heating will take the current baseline of just 2,000 installations per year in 2020 to 64,000 homes fitted in 2025 – a cumulative total of around 126,000 homes, representing 5% of Scotland's housing stock. Scotland is also establishing an expert group to make recommendations to Scottish

⁴ IPCC (2018) Global warming of 1.5°C

⁵ Assuming people replace their heating system approximately every 15 years.

⁶ <https://www.cbi.org.uk/media/5123/heat-policy-commission-final-report.pdf>

⁷ <https://www.ippr.org/files/2020-07/all-hands-to-the-pump-july20.pdf>

⁸ BEIS (2018) Heat Networks Investment Project (HNIP): introduction to the scheme

⁹ BEIS (2020) RHI monthly deployment data: December 2019 (Annual edition)

¹⁰ <https://networks.online/gas/national-grid-launches-future-of-gas-report/>

¹¹ <https://www.hollandtimes.nl/articles/national/the-netherlands-to-go-completely-gas-free-in-the-future/>

¹² <https://alkhaleejtoday.co/business/5425102/Gas-heating-will-be-banned-in-new-homes-from-summer-2021.html#:~:text=The%20new%20RE%202020%20environmental,new%20collective%20housing%20after%202024.&text=The%20maximum%20authorized%20emission%20threshold,%2F%20m%2C%20say%20the%20echoes.>

¹³ <https://www.government.se/492a01/contentassets/419eb2cafa93423c891c09cb9914801b/200224-carbon-tax-sweden---general-info.pdf>

¹⁴ <https://www.gov.scot/publications/protecting-scotland-renewing-scotland-governments-programme-scotland-2020-2021/pages/7/>

Ministers on the scope of a potential heat pump sector deal.¹⁵ This policy framework and targets provide greater certainty of the road ahead for investors and markets, thereby fostering confidence to support the scaling of supply chains.

Home retrofits are increasingly playing an important role in **green recovery strategies** around the world – including the UK (see table below). Several governments have included low carbon heat within their stimulus and recovery packages. In Italy, citizens are offered a 110% refund on the purchase price of a heat-pump via five annual tax breaks,¹⁶ and in Luxemburg, household subsidies for sustainable heating have been increased by 25%, with the state additionally covering 81% of the costs for replacing a heat pump.¹⁷ Lithuania,¹⁸ Finland,¹⁹ New Zealand²⁰ and Canada²¹ are among the list of major economies that have included low carbon heating in pandemic-induced measures. Investing in building new green jobs should continue to be a focus of the economic recovery, given the high jobs multiplier effect from building retrofits, with studies suggesting that every \$1m spent on energy efficiency creates 7.72 full time jobs vs. 2.65 in fossil fuel industries.²²

Scheme	Description
£2.32bn Green Homes Grant stimulus scheme for England (October 2020 to March 2022 (Green Homes Grant); to December 2021 (local authorities))	Provides grants worth up to two thirds of the installed cost of measures including heat pumps, solar thermal, biomass boilers and hybrid heat pumps, capped at £5,000. Low income households can receive vouchers covering 100% of the cost up to £10,000. This was recently topped up by £320m through the Spending Review, with the whole scheme extended to 31 March 2022 ²³ . £500m will be administered locally: £200m via the Green Homes Grant’s Local Authority Delivery (LAD) scheme – where local authorities can bid for funding to support low-income households– and £300m via Local Energy Hubs later. LAD and Hubs projects must be completed by 31 December 2021.
£1.475bn Public Sector Decarbonisation Scheme (October 2020 to March 2022)	From the Conservative manifesto to improve insulation and energy efficiency of public buildings and invest in green heating over the next year, recently topped up by £475m through the Spending Review
£110m from the £3.8bn Social Housing Decarbonisation Fund (October 2020 to March 2022)	Pledged in the Conservative manifesto, initially to pilot new approaches to retrofitting social housing at scale. Timescale unconfirmed.
10-Point Plan	This announced additional funding of £1bn and the extensions outline above In addition to top-ups for the Green Home Grant and Public Sector schemes, the Spending Review that followed announced £150m in grants for the poorest households. The Future Homes Standard will be introduced from 2023. A target for 600,000 heat pump installations per year by 2028 was announced.
In Scotland, £1.6bn in Programme of Government	For energy efficiency and heat in homes and buildings, pledged by the Scottish Government over the next Parliament to support long-term plans.
In Wales, £9.5m Optimised Retrofit Programme	To fund energy efficiency measures in up to 1,000 existing homes owned by registered social landlords and councils. Launching in September 2020, timeline unconfirmed.

¹⁵ <https://www.gov.scot/publications/protecting-scotland-renewing-scotland-governments-programme-scotland-2020-2021/pages/7/>

¹⁶ <https://www.renewableenergymagazine.com/miscellaneous/italian-superbonus-is-one-of-the-most-20200818#:~:text=When%20purchasing%20a%20heat%20pump,via%20five%20annual%20tax%20breaks.>

¹⁷ <https://today.rtl.lu/news/luxembourg/a/1526282.html>

¹⁸ <https://www.rivieramm.com/news-content-hub/lithuanian-stimulus-package-commits-funds-for-renewables-including-offshore-grid-connection-59806>

¹⁹ <https://vm.fi/-/10616/hallitus-paatti-vuoden-2020-neljannesta-lisatalousarvioesityksesta>

²⁰ <https://www.rnz.co.nz/news/budget-2020/416634/budget-2020-what-you-need-to-know>

²¹ <https://www.newswire.ca/news-releases/canada-and-british-columbia-invest-in-green-energy-solutions-838927386.html>

²² <https://www.smithschool.ox.ac.uk/publications/wpapers/workingpaper20-02.pdf>

²³ <https://www.gov.uk/government/news/green-homes-grant-extended-for-extra-year>

2. What key policies, priorities and timelines should be included in the Government’s forthcoming ‘Buildings and Heat Strategy’ to ensure that the UK is on track to deliver Net Zero? What are the most urgent decisions and actions that need to be taken over the course of this Parliament (by 2024)?

The forthcoming Heat & Buildings Strategy addressing heat and energy efficiency must set a roadmap and framework to decarbonise UK homes and, importantly, trigger immediate action. Time is no longer available to focus purely on pilots, demonstration projects and the creation of potentially useful future options. Instead, action should target the earliest possible move towards mass deployment of measures and get on track to meet the target of at least 600,000 heat pump deployments per year by 2028. (Note that this falls short of E3G’s estimate that 10 million heat pumps need to be installed by 2030 for the UK to get on track for 1.5°C.²⁴)

E3G has worked with leading energy companies, manufacturers, green finance organisations as well as groups representing citizens and Local Authorities to develop a set of principles that can be used to underpin government decision-making. These provide a framework to assess specific policies, and are listed below:

- i. **Transparent alignment with carbon budgets on the pathway to net zero**, with long-term term policy and legally binding targets to provide confidence to investors and businesses to invest in technologies, innovation and skills.
- ii. **A need for speed, rapidly deploying solutions that are available and scalable over the next five years**, achieved through incentives that pump-prime the market for energy efficiency and heat pumps, tighter new build standards, the phase out of fossil heating and a regulatory framework to scale up investment in heat networks.
- iii. **Put consumers at the heart of the transition**, providing advice, protection and access for all; delivering better outcomes through healthier, more efficient and warmer homes. Demand-side flexibility solutions, enabled by improved access to data, will help reduce overall energy system costs.
- iv. **A fair and just transition** which ensures no one is left behind – with inclusivity accelerating deployment, lowering costs and ensuring fuel poverty targets are met.
- v. **Levelling the playing field for zero carbon heating** by addressing implicit fossil fuel subsidies, changing the way the transition to net zero is funded by removing policy costs from electricity bills, and considering the potential for a carefully crafted energy-wide carbon price that protects lower-income families.
- vi. **Flexibility for different approaches that are most cost-effective locally, within a coherent national framework**. Encourage local leadership in social housing and public buildings, complemented by heat ‘zoning’ and a heat hierarchy that incentivises innovation and investment, accompanied by a heat Sector Deal to secure lasting economic benefits for the UK.

Specific policy measures can be considered in terms of three elements: governance, delivery mechanisms, and a consumer deal. The relationship of these policy elements to the overarching principles is summarised in the table below:

Principles	1. Governance	2. Delivery mechanisms	3. Consumer deal
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²⁴ https://www.jstor.org/stable/resrep24949#metadata_info_tab_contents

Transparent alignment with carbon budgets on pathway to net zero	Monitoring to ensure progress remains on track; recommendation for technology pathway	Long term policies supported by appropriate funding; accountable delivery bodies at a national and local level	
A need for speed	Recommendations for no regret early actions	Policies to trigger early deployment at scale	
Put consumers at the heart of the transition		Policies and regulation to fully value demand side services	Advice, protection and choice framework to build demand and maintain public consent
A fair and just transition	Access to resources determined by whole system benefit	Funding and support for vulnerable and reduce fuel poverty	Access to all; equitable allocation of costs
Levelling the playing field for zero carbon heat		Fiscal incentives; standards/ regulations, carbon price	Equitable allocation of costs
Flexibility locally within a coherent national framework	Defining zones to link local and national infrastructure choices	Policies to progress from scale demonstrators to mass deployments	

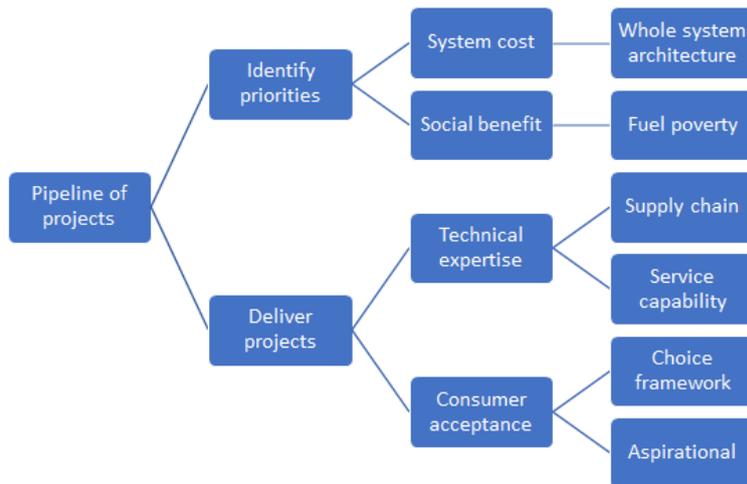
Much of the policy discussion to-date has related to delivery mechanisms. However, the governance framework and the consumer deal will be critical to a successful policy framework and these should also be priorities over the current Parliament.

1. Governance

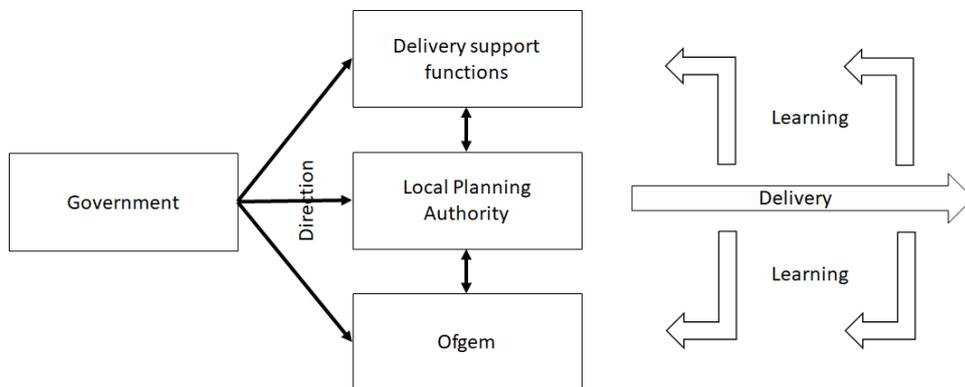
The overall governance framework must address the following issues:

- How **technology and geographical choices** are identified and made and the need for common and robust assumptions about the future
- How **individual investments** are identified and delivered
- How we know we are **on track to meet carbon budgets** and other targets.

There is no longer the time to develop new market arrangements (e.g. local energy markets) and hope that fiscal drivers will stimulate sufficient demand that will in turn encourage new businesses to emerge and grow. A more proactive approach is required to build a pipeline of potential projects. Initially, this should focus on specific local opportunities, ensuring the rapid deployment of measures that will enable new local markets to be self-sustaining once they are established. The chart below sets out what will be required to build a sustainable pipeline of projects and why a local focus will be important:



The chart below provides an overall view of a governance framework needed to meet these requirements:

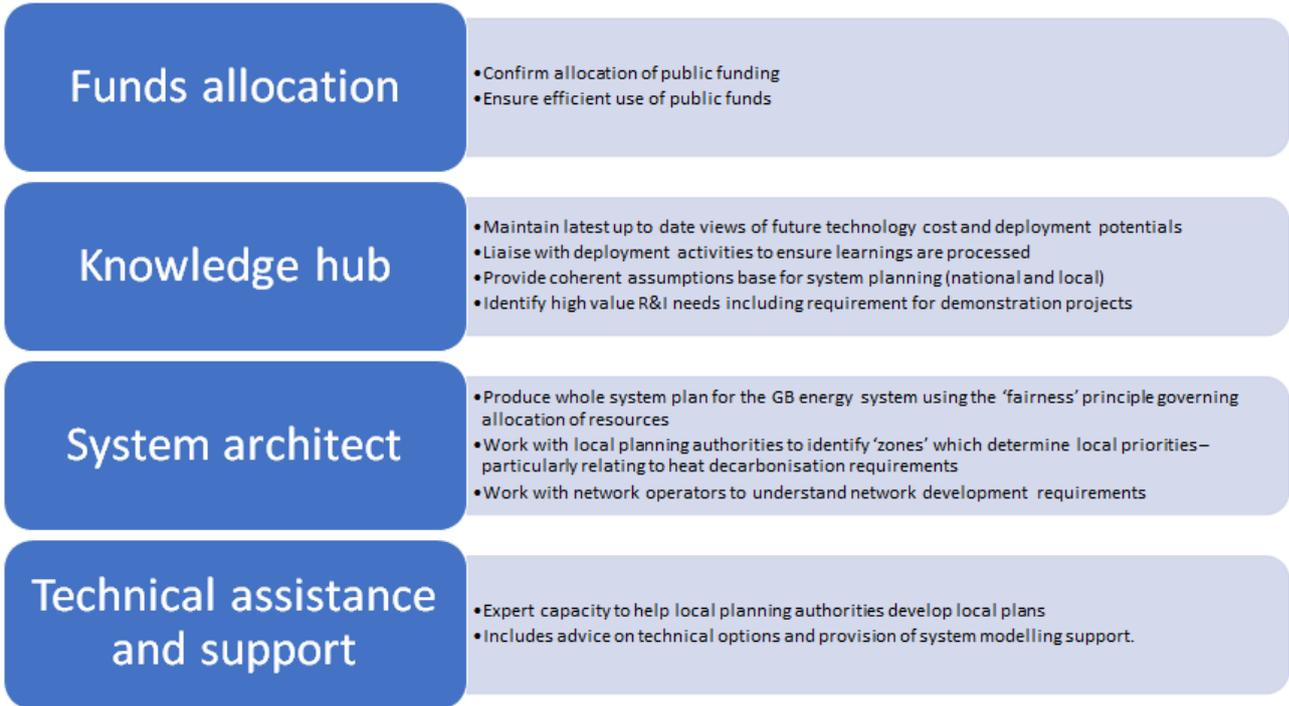


The role of central Government would be to:

- Establish **emissions trajectory** towards net zero via carbon budgeting process including any technology or sectoral targets
- **Define investment cost recovery mechanisms** (market, public funding, regulatory mechanism)
- Set out **consumer choice and protection regime**
- Impose **obligations on local planning authority** to produce delivery plans and establish delivery functions
- Confirm mandates for:
 - **Delivery support functions:** including ensuring fair access to energy resources through whole system planning, maintaining latest best views of technology cost and deployment potential, and providing technical support to reduce capacity burden on local planning authorities
 - **Ofgem:** including working with local planning authorities to develop and implement local energy markets, monitoring compliance with consumer choice and protection regime, increased responsibilities regarding the broader heat market

2. Delivery mechanisms

New delivery support functions will be required to ensure delivery proceeds to time and in the best interests of consumers. These functions are summarised below:



Local Authorities will have an important role to play. Key responsibilities will include:

- **Produce energy system transition plans in line with Government mandate**
 - Using common assumptions base provided by the knowledge hub
 - Ensure consistency with overall energy system planning including using the zoning definition
 - Working with the central technical assistance and support function
- **Establish delivery capability to ensure plans are delivered**
 - Including agreeing a funding plan with the funds allocation body and Ofgem which is in line with Government direction on these issues
 - Ensuring close working relationship with the knowledge hub to ensure all learnings are captured and processed
- **Design and implement local energy markets to ensure optimal use of current and future resources**
 - Working with Ofgem to ensure alignment with national regulatory framework and the consumer choice and protection regime.

Independent regulation will also be important and the role of Ofgem should be broadened to cover entire heat market. Other key responsibilities should be:

- Work with Local Planning Authority to ensure funding plan is in line with Government direction and supported by the Funds Allocation body
- Support Local Planning Authority in development of local energy markets to ensure optimal use of current and future resources and consistency with consumer choice and protection framework
- Monitor ongoing compliance with, and performance against, consumer protection regime
 - Develop and implement remedial measures where shortcomings are identified

Finally, once the Climate Change Committee has produced its final carbon budget recommendation, it will have an important role to play in monitoring progress in line with targets.

3. A consumer deal

A new deal for consumers will be critical. Whatever the underlying climate impacts or economics, successful delivery of low carbon heat and efficiency measures will only be achieved with the proactive support of consumers. This, in turn, can only be achieved if the process of identifying and installing measures, and the service experience thereafter, is recognised to deliver clear benefits. Ensuring this is the case is the biggest policy challenge facing the government.

This new deal for consumers should have four key elements:

- It should be **easy and convenient** for consumers to take the necessary actions
- Consumers should be provided with **excellent service**, throughout the installation process and thereafter
- It should be clear that retrofitting homes and buildings represents the **way forward, creating modern and more comfortable** living and working environments. It should, therefore, become the aspiration of all property owners.
- It must be seen to come at a **fair price**, representing good value compared with alternatives.

Achieving this goal will require a combination of leveraging the power of competitive fast-moving retail markets with the controls and protections of an enhanced regulatory framework. Developing a new consumer deal should be the top priority for the heat and energy efficiency strategy.

The Heat & Building Strategy should ensure access to resources is determined by whole system benefit so that scarce resources, such as green hydrogen, deliver the greatest benefits to all citizens. A **consumer deal should enable access to all**, with equitable allocation of costs to support lower income households. The **Fuel Poverty Strategy** acting as a heat transition strategy must ensure that no households are left without access to warm and healthy zero carbon homes. Local Authorities and social landlords should be equipped to scale up zero carbon heating solutions in low-income households. This in turn can spur the innovation and scaling of supply chains that bring down costs in a way that everyone benefits from, therefore also supporting the 'able to pay' market.

Specific policy mechanisms to get on track for zero carbon heating

Many specific mechanisms to incentivise action and support delivery have been proposed by industry, finance, academics and the third sector. It is widely accepted that a **long-term policy outlook, accompanied by targets and milestones**, is essential to provide industry and investors the confidence and certainty to invest in the skills and technologies needed to ensure a mass-market for smart, zero carbon heat this decade. With more confidence in short and long-term domestic demand, manufacturers and service providers can invest appropriately in their capacity²⁵. The raft of decisions to be made through the Heat & Buildings strategy – as well as parallel decision making, such as the Future Home Standard, Net Zero Review, National Infrastructure Strategy and Energy White Paper – must collectively form a **coherent national framework**, which identifies the regulatory path ahead for 2030 and beyond.

While certain policy decisions and regulations are best implemented at a national level – such as incentives and tax measures, or a potential carbon price – there is also a need for **local governance mechanisms that spur local leadership** which helps scale up innovations and supply chains for zero carbon heating. There is a growing consensus that different approaches to decarbonisation will be needed to reflect regional variation and assets – including through Local Area Energy Planning,²⁶ Heat and Energy Efficiency Zoning,²⁷

²⁵ Chief Construction Adviser (2015) *Solid Wall Insulation: Unlocking Demand and Driving Up Standards*

²⁶ <https://es.catapult.org.uk/wp-content/uploads/2018/12/Local-Area-Energy-Planning-Guidance-for-local-authorities-and-energy-providers.pdf>

²⁷ <https://www.theade.co.uk/resources/publications/heat-and-energy-efficiency-zoning-a-framework-for-net-zero-for-new-and->

and Local Industrial Strategies that support a just transition.²⁸ Since no ‘one size fits all’ solution is appropriate for decarbonisation, it is therefore also likely that the structures required for delivery will also vary. Nonetheless, there is still a role for central government supporting regional implementation through the provision of good practice frameworks, with **minimum requirements** regarding robust governance, independent scientific rigour and social indicators.

Zoning considers the most appropriate heat decarbonisation and energy efficiency solutions for any given area through a consultation process with local stakeholders.²⁹ Local authorities can identify specific areas with high potential for heat networks, or other solutions. This in turn could encourage the development of innovative business models and financing approaches, helping Local Authorities and social landlords aggregate demand for projects in specific areas, which could help increase access to lower cost finance. In a welcome move, BEIS has announced it will consult on a framework for heat network zoning in Spring 2021.³⁰ The Heat & Buildings Strategy can cement this approach, signalling governance arrangements that will support a locally led approach for the Strategy’s implementation, learning and refinement.

The Prime Minister’s 10 Point Plan included a welcome new target to install 600,000 heat pumps per year by 2028. While this far outstrips today’s level of installations, it still falls short of E3G’s estimation **that 10 million heat pumps would be needed by 2030** – in addition to energy efficiency improvements and district heating – in order to drive greenhouse gas reductions proportionate to what the IPCC says is needed globally by 2030 to stay within a good chance of limiting global warming to 1.5C.³¹ 600,000 per annum target is nonetheless a welcome step in the right direction and will provide business confidence to scale supply chains and train employees.³²

Without significant additional measures to drive the take-up of heat pumps, the Government will remain far off track towards the 600,000 target. Existing and proposed measures fall well short, as illustrated in Figure 1.

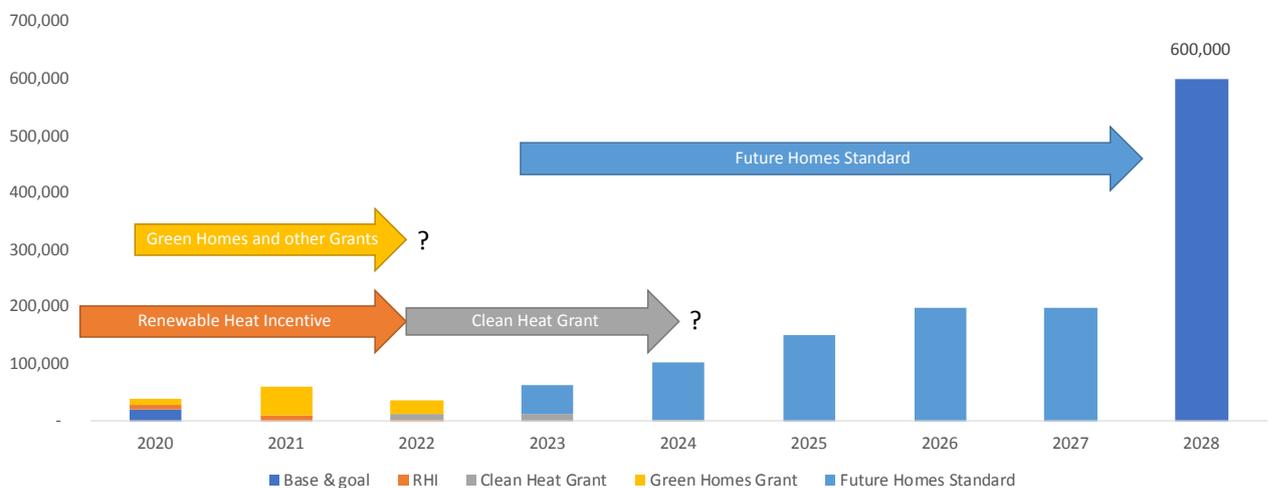


Figure 1: timeline and potential impact on heat pumps deployment from current and proposed policies towards 600,000/a goal

Additional targets could also be considered. The Energy Efficiency Infrastructure Group (EEIG) recommends **bringing forward the EPC C target for homes from 2035 to 2030** and introduce a new goal to **halve**

[exis#:~:text=The%20Zoning%20Framework%20is%20based,and%20technologies%20to%20do%20so.](https://www.theade.co.uk/news/press-releases/right-place-right-stuff-gov-to-put-local-areas-in-charge-with-zoning-consul)

²⁸ https://neweconomics.org/uploads/files/NEF_trust-in-transition.pdf

²⁹ <https://www.theade.co.uk/news/press-releases/right-place-right-stuff-gov-to-put-local-areas-in-charge-with-zoning-consul>

³⁰ <https://www.theade.co.uk/news/press-releases/right-place-right-stuff-gov-to-put-local-areas-in-charge-with-zoning-consul>

³¹ <https://www.jstor.org/stable/resrep24949>

³² https://www.jstor.org/stable/resrep24949?seq=1#metadata_info_tab_contents

emissions from heating existing homes by 2030.³³ This would be commensurate with the pace of decarbonisation needed³⁴, aligned with Scotland’s ambition for heat³⁵, and can be technically delivered in ten years – principally through heat pumps³⁶. It is also essential that houses being installed with heat pumps are well insulated, due to their lower running temperatures.

Meeting these targets will require long-term capitalisation, with a finance strategy that articulates the role of public and private finance that will be required to meet targets. The Energy Efficiency Infrastructure Group calculates that **£5.8 billion of public capital** should be allocated in Treasury’s Spending Review towards supporting heat pumps deployment in existing homes, drawn from the £100 billion infrastructure budget for this Parliament. BEIS can engage with Treasury on the amounts required for different departments to underpin the review.

Zero carbon heating needs to be **embedded in regulation and standards** that encompass green home retrofits, ensuring that all frameworks are complementary and support the heat transition. This will require a review of Energy Performance Certificates (EPCs). These should also reflect a **fabric-first principle** which is centred on energy efficiency, as well as measures to embed **sustainable and circular design into the materials and products** used to decarbonise homes. This could include a review of embodied carbon;³⁷ circular design and construction; a review of potential toxic or harmful chemical and substances; and accelerated phase-out of F-gases in heat pumps³⁸. These measures should also contain climate resiliency, considering how retrofits and construction can make our homes more robust to the anticipated impacts of climate breakdown, such as flooding and heat waves. This could include considerations such as water savings, passive cooling and green roofs.

In order to get on track for climate targets, the UK needs to rapidly scale up the deployment of zero carbon heating solutions which are already available. This should focus on **energy efficiency, heat pumps and district heating** – which have been identified as comprising the most effective investment pathway for heat decarbonisation for the next 10 years.³⁹ Other technologies such as green hydrogen may have zero carbon heat potential further down the line. Green hydrogen is currently expensive and likely to remain a scarce resource, with most commercial opportunities in harder-to-abate applications in industry and freight. Please see our response to question 3 for more detail on the role of hydrogen for heating.

New builds are a low-hanging fruit and ensuring that these homes are zero carbon will avoid costly retrofits later. Bringing forward the **Future Home Standard** to 2023 or sooner – as was reportedly planned to be part of the Prime Minister’s 10 Point Plan – would be a welcome step.

Currently, the rate of **existing homes** being connected to the gas grid far outstrips installations of zero carbon heating solutions. The call to ban gas boilers is widely supported – including by a Heat Commission convened by the CBI and University of Birmingham, supported by leading industry figures, who recommend a ban from 2025⁴⁰. **A date should be set to phase out the purchase of fossil boilers altogether, starting in buildings off the gas grid.**

Further actions should be taken to **pump-prime the market** for energy efficiency and heat pumps. The announcement to extend and expand the Green Home Grant is welcome, with the vouchers redeemable

³³ https://www.theeieg.co.uk/media/1098/eeig_report_turning_stimulus_into_recovery_pages_0920.pdf

³⁴ By eliminating 45% of today’s emissions by 2030 to limit global warming to 1.5°C. See IPCC (2018) *Global Warming of 1.5 °C*.

³⁵ Scotland is seeking to fully eliminate emissions from heat buildings by 2040. See Scottish Government (2020) *Protecting Scotland, Renewing Scotland*.

³⁶ Modelling for the National Infrastructure Commission finds that the combination of energy efficiency and heat pump deployment can reduce emissions from heating buildings by 44% by 2030. See Element Energy (2018) *Cost analysis of future heat infrastructure options*.

³⁷ LETI (2020) *LETI Embodied Carbon Primer: Supplementary guidance to the Climate Emergency Design Guide*

³⁸ Environment Agency & Defra (2019) *Bans on F gas in new products and equipment: current and future*

³⁹ https://d2e1qxpsswcpqz.cloudfront.net/uploads/2020/09/The_pathway_to_net_zero_heating_UKERC_briefing.pdf

⁴⁰ <https://www.cbi.org.uk/media-centre/articles/no-new-conventional-gas-boilers-in-homes-after-2025/>

for low carbon heating solutions including heat pumps. An exit strategy is needed to ensure the market is sustainable into the long run, with BEIS working with treasury to devise long-term incentives to pump-prime the market. In addition, there is a need for a **regulatory framework to scale up investment in heat networks**.

Low public awareness regarding zero carbon heating solutions – as well as lack of knowledge regarding the contribution of UK homes to greenhouse gas emissions – is a barrier to the rapid decarbonisation of heat. Recent studies have shown that despite growing public concern about the climate emergency, awareness of gas boiler alternatives such as heat pumps remains low,⁴¹ and there is still a common misconception that ‘gas is green’. **Improved education and public engagement campaigns** could support the need for speed, as well as a focus on **training and skills**. A fossil phase-out date, set out early, would have an enormous impact on the salience and traction of engagement and training programmes. There will also be a role for increasing skills and awareness among the zero-carbon heating value chain – from boiler installers, through to finance institutions. BEIS can work with the Department for Education, TrustMark and relevant industry trade bodies to develop a commensurate plan to meet the zero-carbon skills needed. **Building Renovation Passports** can play a critical, enabling role in increasing education and engagement around green home retrofit options, including for zero carbon heating.

Supply chain development could be boosted by a **heat pumps sector deal** – analogous to that for the offshore wind industry. A Sector Deal could support innovation and manufacturing outside of London and the South East, therefore contributing to the Government's levelling up priority. For instance, there is currently a heat pump manufacturing plant located in Livingston, Scotland which the Scottish Government is currently exploring as an 'anchor' location for a Sector Deal. In England, Kensa, a British firm, manufactures ground source heat pump systems in Cornwall.

It will be necessary to focus on **grid flexibility**, helping reduce costs and strains on the energy grid due to increased demand for electricity sparked by uptake in heat pumps and electric vehicles. Flexibility will be key for ensuring demand can be met through renewable sources, with upgrades to networks and storage required to achieve this. The National Infrastructure Commission said a “smart power revolution”, making use of interconnectors to other countries, flexible demand and electricity storage, could keep these costs to a minimum, potentially saving up to £8bn a year by 2030.⁴² In a flexible grid, supply from batteries and demand flexibility could help reduce the requirement for peaking power plants – designed to operate for a few hours at a time when demand is highest. This would also cut the cost of fuel needed to run these plants and the carbon costs of their emissions. BEIS can work with Ofgem and energy companies to work towards these solutions. Flexible tariffs for heat pumps can be offered to consumers to help lower costs and impact on the grid, as seen for example with Good Energy.⁴³

Currently, zero carbon heating systems, such as heat pumps, compete on an unlevel playing field due to a regulatory framework and incumbent market that favours gas, with existing ‘sunk costs’ in fossil infrastructure. The cost of conversion from fossil fuel-based systems to zero carbon heating infrastructure should be incorporated into **infrastructure costs and bill plans**. A carefully considered **carbon price** could help change the economics to reflect the carbon savings that can be achieved through heat pumps. This would need to be set up in way which does not adversely impact fuel poor and lower income households, with additional support and measures to ensure access and availability of zero carbon heating systems. The recommendations of the Zero Carbon Commission should be considered to achieve this.⁴⁴ The Commission outlines a clear carbon price trajectory with a sectoral differentiated approach, including specific recommendations for its introduction in the heating sector.

⁴¹ <https://www.gov.uk/government/publications/transforming-heat-public-attitudes-research>

⁴² <https://www.carbonbrief.org/uk-needs-a-smart-power-revolution-says-infrastructure-commission>

⁴³ <https://www.renewableenergyhub.co.uk/blog/good-energy-to-introduce-first-home-heat-pump-tariff-in-the-uk/>

⁴⁴ <https://static1.squarespace.com/static/5e1ee218fbeca217fe06a421/t/5f67b4bcc9621301a2109c9c/1600632008945/Zero+Carbon+-+How+carbon+pricing+can+help+Britain+reach+net+zero+emissions+by+2050.pdf>

3. Which technologies are the most viable to deliver the decarbonisation of heating, and what would be the most appropriate mix of technologies across the UK?

The government's core strategy should be to focus on **energy efficiency measures and heat electrification** as near-term solutions. New, consolidated academic research by UKERC finds energy efficiency, heat pumps and district heating comprise the most effective investment pathway for heat decarbonisation for the next 10 years.⁴⁵ E3G suggests that the deployment of 10 million heat pumps by 2030, alongside energy efficiency improvements and the deployment of heat networks, can drive rapid reductions in CO₂ emissions from heat required to get on track for a 1.5°C scenario.⁴⁶ This is consistent with the Climate Change Committee's recent preview of key metrics of success in a letter from its Chair to the Secretary of State advising on the UK's Nationally Determined Contribution to the Paris Agreement⁴⁷.

The **technology landscape is fast evolving, and there is no 'one size fits all' solution**. A governance process is needed to help make the choices about which technologies should be deployed where and when, with decisions supported for instance by a **National Delivery governance structure** (see response to question 2). A risk-based approach is needed – identifying where options should be kept open and when immediate progress is required.

Energy efficiency improvements need to play to reduce heat loss and the cost of keeping warm.⁴⁸ The replacement of fossil-fuelled heating systems with low-carbon alternatives requires considerably more investment, in which energy efficiency upgrades will play a crucial role in keeping costs to a minimum. Without all appropriate efficiency improvements, the cost of heat decarbonisation could be £6.2bn higher per year to 2050.⁴⁹

Gas heating needs to be rapidly phased out to put the UK on track to meet its net zero target. Gas is a fossil fuel which releases CO₂ when combusted for use in heating systems, with additional greenhouse gases arising from upstream methane leakages - which are commonplace (and often under reported) along the supply chain.⁵⁰ The role of **hybrid heat pumps is currently debated by the sector**, with some fearing it could delay the longer-term transition to non-hybrid heat pumps. There are reports that hybrid heat-pumps are too small to be fully zero carbon, and so their mass roll-out could tie in fossil fuel usage over their lifespan (10-15+ years), or lead to the installation of undersized heat pumps which will require replacing in the future. Others see them as having a potential role to play in the transition period, helping normalise new heating solutions. If hybrid heat pumps are to gain mass market, it is important that they are suitably sized to handle the full electricity load required for zero carbon.

E3G recognises that deploying 10 million heat pumps to 2030, while consistent with climate science, CCC advice and the need for UK leadership, is a major challenge. We suggest that the lowest regret pathway to deploying heat pumps to 2030 at this scale must begin with:⁵¹

- **Energy efficiency:** making all UK homes highly energy efficient by 2030, reducing the cost to households of decarbonised heat and rapidly increasing the pool of properties suitable for heat pumps to achieve optimal performance.

⁴⁵ https://d2e1qxpsswcpgz.cloudfront.net/uploads/2020/09/The_pathway_to_net_zero_heating_UKERC_briefing.pdf

⁴⁶ https://www.jstor.org/stable/resrep24949?seq=7#metadata_info_tab_contents

⁴⁷ <https://www.theccc.org.uk/publication/letter-advice-on-the-uks-2030-nationally-determined-contribution-ndc/>

⁴⁸ Without energy efficiency, the costs of decarbonising heat have been estimated to be £6.2 billion higher per year to 2050. See Imperial College London for the CCC (2018) Analysis of Alternative UK Heat Decarbonisation Pathways

⁴⁹ Imperial College London (2018) Analysis of Alternative UK

⁵⁰ http://priceofoil.org/content/uploads/2019/05/gasBridgeMyth_web-FINAL.pdf

⁵¹ https://www.jstor.org/stable/resrep24949#metadata_info_tab_contents

- **New build:** ensuring new homes are net zero compatible should start right away. The Future Homes Standard will rule out fossil heating in new homes. The size of the opportunity for deploying low carbon heat in new homes – through heat networks and heat pumps – will amount to between 1.6 and 3 million dwellings to 2030.
- **Off-gas properties:** there are approximately four million homes in the UK in this category, which have been the mainstay of domestic RHI deployment to date. Over half of these could be currently suitable for heat pump deployment, more so in conjunction with the manifesto-pledged Home Upgrade Grants for energy efficiency improvements for low income households living in very inefficient homes off the gas grid.
- **On-gas, post-war, suburban houses:** typically reasonably efficient, these homes could also be a priority for heat pump deployment, potentially also as hybrid heat pump systems to begin with – combining with a gas boiler to meet peak heat demand using low carbon gas in future, leaving the heat pump to provide over 80% of the heat in this type of home. In England, there are 11 million homes in this category, for whom the Green Homes Grant is currently available.

Investment in **advice, skills and innovation** for energy efficiency and the installation, commissioning and maintenance of heat pump and hybrid heat pump systems is paramount. The installer base alone needs to grow to 38,000 to deliver 10 million heat pumps by 2030, a major employment boost – and for workers furloughed or laid off an opportunity to reskill to the highest standards to assure system performance – in the context of post-pandemic economic recovery.

As previously noted, the design standards that underpin any technological approach and design should also embed **sustainability and circularity, as well as climate resiliency**.

Hydrogen for heating

Zero emissions hydrogen sourced from renewable energy (known as green hydrogen) is currently a scarce, premium commodity. As a result, its use should be focused on where it adds most value, i.e. in sectors where no alternative is available (e.g. providing high temperature heat and feedstock for some industries, shipping and aviation). Its success and scalability is closely tied to progress on efficiency and renewables⁵² and the legitimacy of any public funding for hydrogen hinges on a simultaneous phase out of unabated fossil gas.

Hydrogen from fossil gas (known as blue hydrogen) is not zero emissions and cannot play a role in the long term. Even in the transition, an overreliance on it could slow efforts to meet carbon budgets, by diverting resource to the to date slowly progressing carbon capture infrastructure instead of making fast gains on efficiency and renewable energy. An only transient role of blue hydrogen requires an evaluation of whether the investment costs associated with it are warranted.

Hydrogen is an important innovation agenda, but in terms of contribution to a cost-effective economic recovery other decarbonisation measures such as investments in energy efficiency and renewable energies have much stronger job and multiplier effects than hydrogen. In addition, deployment of hydrogen – blue or green – requires infrastructure transformation. While estimates of the costs for refurbishing the gas grid are uncertain, a study for Germany indicates a minimum of €45bn for a full conversion of the network.⁵³ Another study for the EU concludes that the costs of converting distribution networks and appliances for

⁵² CCC (2018), [Hydrogen in a low carbon economy](#)

⁵³ Marcogaz (2019), [Hydrogen Admission into existing natural gas infrastructure and end use](#)

hydrogen use are prohibitive.⁵⁴ In addition, supply and demand patterns may look very different compared to the current network, requiring a different network shape.

Claims of widespread applicability of hydrogen within the heating sector are unproven and potentially misleading. The CCC found that the sunk costs of having an extensive gas grid do not automatically mean that it will be lower cost to switch it over to hydrogen and use it in boilers. Their analysis found that the costs of a range of pathways for heat decarbonisation are similar including those in which the gas grid has a much-reduced role or is decommissioned.⁵⁵ Furthermore, the CCC found that full conversion of the UK's gas distribution networks to hydrogen would lead to a very high demand for hydrogen by 2050 (470 TWh even allowing for substantial improvements to buildings energy efficiency).

Given the relatively low efficiency of hydrogen energy chains, this requires more energy input than some other pathways, raising questions over feasibility of delivery, import dependence and residual emissions.

A very high level of hydrogen consumption means that its production would depend heavily on fossil fuels - most likely natural gas - combined with carbon capture and storage. This would imply very high levels of natural gas consumption in 2050, including a high reliance on gas imports. A 'low-regrets' approach to the decarbonisation of heating could contain a combination of focus on new builds pursued through the Future Homes Standard, energy efficiency retrofits, heat pumps in off-gas areas, and scaling up of heat network investments.

4. What are the barriers to scaling up low carbon heating technologies? What is needed to overcome these barriers?

Key barriers, and potential means to overcome them include:

- **Consumer passivity:** At present, the easiest option for homeowners is inaction – and this is what the majority choose. Action is required to catalyse the conditions for change, spurring action and investment. This requires a **new approach to the way choices are presented:** a mixture of strong regulation, education and standards. Some of these measures are identified below.
- **Upfront costs:** The high upfront costs associated with zero carbon heating solutions such as heat pumps and heat networks – combined with the costs of necessary, complementary energy efficiency measures – are a major obstacle to the mass installation of solutions, particularly compared to the low costs of gas systems and lack of penalties for inaction. Overcoming this requires **lowering costs through scaling supply chains and innovation**, with a role for **incentives and subsidies** to pump-prime the market. Lack of affordable options for individual homeowners has limited installations in the able-to-pay market, whilst also dissuading large landlords from investing in the transition. Access to capital for both individual consumers and businesses can be addressed through **concessional finance**, which could in time be offered through the newly announced National Infrastructure Bank. **Fabric-first** should be mandated, to ensure cost savings are achieved alongside the greatest emissions reductions possible.
- **Fuel economics:** Currently, the electrification of heating for net zero competes on an unlevel playing field, due to the power of incumbent fossil fuel-based systems, as well as government tax breaks and other forms of support. This can be mitigated through exploring the introduction of a rising **carbon price** on natural gas, coupled with **compensatory measures for**

⁵⁴ Gas for Climate (2020), [Gas Decarbonisation Pathways](#)

⁵⁵ <https://www.theccc.org.uk/wp-content/uploads/2018/11/Hydrogen-in-a-low-carbon-economy.pdf>

low-income households to ensure no adverse effects for households in fuel poverty – to level the playing field for efficient electric heat and therefore supporting the development of the market for zero carbon heating manufacturing and skills. This is a key barrier to making projects economically viable across all current leading technology types. **Mandating the end of sales of all gas and other fossil boilers within a clear timeline**, like the approach taken with internal combustion engine car sales, would provide a clear signal away from fossil fuels.

- **Low levels of awareness and knowledge:** This covers multiple areas and stakeholders, including a low understanding of the scale and speed of transition required, technology and financial options available, benefits of the new technologies, potential cost savings, and busting myths associated with gas boilers and zero carbon solutions.⁵⁶ **Government-backed information and education campaigns** should be developed and launched, bolstered by a fossil phase-out timeline, delivered at a local level by trusted sources and supported by the energy, retrofit and finance sectors. For consumer choice, the introduction of **Building Renovation Passports** would allow easy access to advice on the financial and technological options available. This could be coupled with **zoning** policies to increase consumer awareness on the choices available in their specific area (e.g. if they are in a designated District Heating zone, the Passport would inform them of the opportunity to connect to the network when their boiler needs replacing).
- **Consumer confidence.** Few consumers are aware of low carbon heating options, and there is low general awareness (and therefore trust) of the brands and manufactures of solutions such as heat-pumps, in unfavourable comparison to ‘household name’ manufacturers of gas boilers. **Quality assurances** should be given on: disruptive aspects of installation, progress made to avoid mis-selling, poor installations and Section 75 liabilities (e.g. through quality standards such as MCS and TrustMark), and availability of supply chain. The latter will be aided by a clear long-term policy roadmap. **Building Renovation Passports** could also be supported as a tool to increase awareness of heat pumps as a measure that property owners can install to decarbonise their homes, with links to supply chains and public and private funding sources.
- **Lack of long-term policy certainty:** Companies and investors require **long-term policy and regulatory clarity** in order to scale business to the levels required to achieve decarbonisation. Manufacturers and installers need this to underpin increased investment in technologies and in training employees, as well as identifying the locations where supply chains should be scaled up. Those investing in district heating noted that lack of clarity on the UK’s roadmap for heat decarbonisation means that it is hard to ascertain the future size of the investment opportunity in this space and the specific technologies to support in the near-term.
- **Uncertainty of the future role of hydrogen for heating:** At present, with hydrogen for heating remaining on the table, industry has no incentive to direct attention to scaling up capacity in electric heating solutions, and continues to invest in gas infrastructure and boilers, which might be argued to play a role in a hydrogen for heating future. Government should clarify through the forthcoming **Hydrogen Strategy** which sectors it will prioritise green hydrogen in, as well as confirming that only green hydrogen will play a role in the UK’s strategy for zero carbon.

5. How can the costs of decarbonising heat be distributed fairly across consumers, taxpayers, business and government, taking account of the fuel poor and communities affected by the transition? What is the impact of the existing distribution of environmental levies across electricity, gas and fuel bills on drivers for switching to low carbon heating, and should this distribution be reviewed?

⁵⁶ <https://www.gov.uk/government/publications/transforming-heat-public-attitudes-research>

Resources should be allocated on the basis that they **minimise total system costs**, thereby maximising value for all consumers and minimising costs for the taxpayer. This means following the **heat hierarchy** with energy efficiency first and direct energy sources reserved for needs that cannot be met cost-effectively through waste heat recovery or upgrading heat. Costs should be implemented via a new governance framework that ensures the use of consistent and up to date technical assumptions and whole system planning.

Beneficiaries should be expected to pay for their heating services to minimise any cost burden on those that are unable to act quickly, but public financial support should be sufficient to retain strong incentives to act. Energy consumers who are unable to pay or take advantage of the opportunity for other reasons should receive additional support to adopt low carbon heating solutions in line with the **overall, soon-to-be updated (in England) strategy to end fuel poverty**.

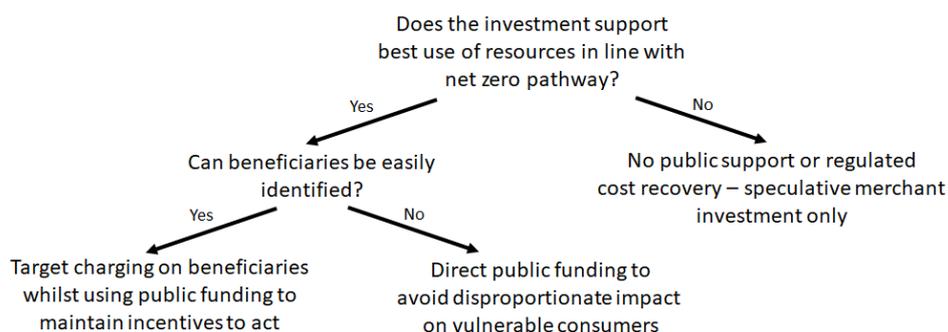
Furthermore, the system should put the consumer at the heart, ensuring a comprehensive offer is available to consumers that meets all their needs and retains their ability to choose. The offer should involve:

- i. Fair price for installation and subsequent energy consumption
- ii. Modern heating systems taking advantage of digital technologies
- iii. Convenience and minimisation of disruption
- iv. Excellent service throughout installation and thereafter
- v. Clarity of options available to ease the customer journey

A consumer protection regime should ensure compliance with these requirements.

We note an important role for **public and private finance** in supporting the distribution of costs. Financial innovation and the development of new products and services can help leverage additional private finance from the ‘able to pay’ market, which can be incentivised further through measures such as the Green Home Grant, Renewable Heat Incentive and future stimulus actions. The new **National Infrastructure Bank** could also support blended finance solutions through providing zero- and low-interest loans to consumers to support the purchase of zero carbon heating systems.

The chart below sets out the choices for determining how to pay for investments in low carbon heating measures:



6. What incentives and regulatory measures should be employed to encourage and ensure households take up low carbon heat, and how will these need to vary for different household types?

We cannot simply rely on economic drivers to encourage property owners to install low carbon heating systems and efficiency measures. The choice to act or not must be presented in such a way that ‘do nothing’ is no longer the easy and obvious response. This will involve three elements:

1. A programme of introducing tighter building and heating appliance standards should progressively remove high emission heating options.
2. Peer pressure will be important as good experiences of property upgrades are shared. This is particularly important for local community initiatives.
3. The overall consumer deal described in question 2 will also be essential.

The cost of decarbonising heat will inevitably remain critical to the consumer deal. It should be spread based on ability to pay – with **incentives that become self-sustaining** for the able to pay and **continued help for lower income households** to ensure no one is left behind. As a starting point, the Government can extend and build upon the Green Home Grant, which provides £5,000 to households towards the costs of green home retrofits (including low carbon heating solutions) and up to £10,000 for lower income households, covering the full cost of installations. Additional support can be provided through the Homes Upgrade Grant and Social Housing Decarbonisation Fund. **Near-term mandating of zero carbon measures for publicly owned buildings and large social housing providers** would greatly incentivise scale up in supply chains, reducing costs to the wider market before it would be affected by wider fossil heating phase-out regulations.

A programme of structural incentives is needed to stimulate the able to pay market and leverage private finance, backed by a reliable regulatory framework to drive buildings’ carbon and energy performance. The Coalition for the Energy Efficiency of Buildings – of which E3G is the secretariat – convened a meeting of expert stakeholders in summer 2020, who made a series of suggestions that would help support this, including:⁵⁷ a zero carbon heating technology rebate system; VAT reform to stimulate energy efficient and zero carbon heating renovation; landlord and business energy saving allowance; domestic green home retrofit salary sacrifice scheme; property assessed clean energy (PACE) financing; Green Stamp Duty and a green Help-to-Buy scheme.

7. What action is required to ensure that households are engaged, informed, supported and protected during the transition to low carbon heat, including measures to minimise disruption in homes and to maintain consumer choice?

A new **consumer protection regime** is required that assures the quality of the product, standards of service during and after installation, and that the price is fair. This may involve regulatory changes, such as extending the remit of Ofgem to cover all the heat market. Approaches that support **zoning** will also require effective, localised communication with and between people benefitting from the new measures. More information on these suggestions is provided in response to question 2.

All advice and engagement on low carbon heat must follow a **fabric-first approach**, which involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems. By maximising the energy efficiency of a home, less energy will be required to heat it, therefore lowering the costs of zero carbon heating solutions, and transition costs for customers.

⁵⁷ <https://www.greenfinanceinstitute.co.uk/wp-content/uploads/2020/06/Stimulus-actions-for-a-greener-and-more-resilient-property-sector-.pdf>

There is a role for **Building Renovation Passports** in informing and engaging consumers about the steps they need to take to get their house on track for zero carbon – including appropriate heating solutions – with links to the supply chain and funding options and opportunities. The **MCS** and **TrustMark** platforms could also be used to engage consumers about zero carbon heating solutions available, while financial institutions can play a valuable role in disseminating information through engaging the 97% of UK adults that are ‘banked’.

While advice and support should be available to all households, there is a need for the Government and Local Authorities to support **lower income families and those in fuel poverty**. The heat transition strategy should also be a plan to end fuel poverty, ensuring no one is left without access to a warm, healthy and zero carbon home.

There is debate and discussion regarding the **levels of disruption associated with different technologies**. For example, health and safety risks have been identified around the introduction of hydrogen into homes. The risks associated with the storage of hydrogen (under high pressure or cryogenically in liquid form) and its use in Fuel Cell applications, are well appreciated by HSE and a comprehensive Guidance Note (HSG 243) has already been issued on the subject. In addition, work is already underway on various aspects of the fire and explosion hazards at the Health and Safety Laboratory, including investigations into the perceived risk of spontaneous combustion.⁵⁸ These risks – as well as perceptions associated with different low carbon heating technologies – need to be considered to ensure that households are supported and protected during the transition to low carbon heat.

8. **Where should responsibility lie for the governance, coordination and delivery of low carbon heating? What will these organisations need in order to deliver such responsibilities?**

Our proposals for a new governance framework are set out in the response to question 2.

December 2020

⁵⁸ <https://www.hse.gov.uk/horizons/current-issues/energy-topics/hydrogen.htm>