Sustainable Markets Initiative

Cleantech Homes: Lower Bills, Healthier Living

Putting new-build cleantech homes at the vanguard of domestic decarbonisation

Baringa

Purpose of this report

This report has been written for organisations and policymakers involved across the housebuilding value chain. Its aim is to argue for faster decarbonisation of the UK's new-build residential property sector. The report highlights the progress made to date and the further industry and policy actions required to accelerate the transition from gas to clean technologies.

This report has been produced as part of the Sustainable Markets Initiative (SMI) Cleantech Homes Lighthouse Project, which involves leading UK businesses committed to the net-zero transition. SMI Lighthouse Projects are created to demonstrate the ways in which stakeholders are making concrete progress to address the pressing societal, economic, environmental, technology, regional, and industry challenges of our time.

This report has been written by energy transition consultancy Baringa Partners, in partnership with Octopus Energy, and with contributions from SMI Lighthouse Project members. It has been prepared on behalf of the SMI.

SMI Taskforce Members

Bellway

Future Homes Hub

The Hill Group

LLOYDS BANKING GROUP

octopus energy

UK Power Networks

Peabody

platform housing group

pobl

rightmove

RICS

savills

What is a cleantech home?

Cleantech homes have electric heating systems like heat pumps. They are not connected to the gas grid and do not use any other fossil fuel for heating. They can go further than electric heating, for example with an electric vehicle charger or solar panels and batteries. These homes are 'net-zero ready' – as they only have electric appliances, the energy they use will be carbon-free once the National Grid achieves its 100% clean electricity target, which is currently by 2030.[1]

Contents

1 https://labour.org.uk/wp-content/uploads/2024/03/Make-Britain-a-Clean-Energy-Superpower.pdf

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1. Executive Summary

The transition to net-zero demands a major shift in how we power and heat our homes. Domestic heating is responsible for around 18% of UK carbon emissions, so building cleantech homes with electric rather than gas heating is a vital stepping stone to a sustainable future.[2] There has been major progress, with nearly 16% of new houses and 33% of all homes (including flats) now having electric heating.[3] But these numbers are still too low – and every boiler installed now will need costly retrofitting later.

This report makes the case for a quicker transition to cleantech homes in the new-build sector

With the SMI Lighthouse Project members involved in this report, we have analysed the substantial financial benefits to homeowners and developers, consumer satisfaction and demand for low-carbon technologies, and the progress being made on training and grid connections. Members have also made significant pledges to boost the roll-out of cleantech homes.

Here are the key takeaways:

1.1 Cleantech homes bring big financial benefits

Energy bills reduce by 40-100% from day one. Cleantech homes with a heat pump, smart tariff, and mid-sized solar array have 40% cheaper bills, compared to like-for-like new-build homes with gas heating. Savings are even greater, reaching around £1,300 a year (a 53% saving), when cleantech homes are compared to existing gas-heated homes. And people can eliminate their energy bills entirely by having larger amounts of solar, battery storage and an appropriate smart tariff.[4,5]

Savings reach up to £18,500 over 25 years. Importantly, because of these bill savings, new-build cleantech homes make financial sense even when factoring in the potential additional upfront cost of purchasing one. Our research found that savings could reach up to £8,500-18,500 over 25 years for new-build cleantech homes with larger amounts of solar and a battery.[6]

2 National Audit Office (2024) Decarbonising home heating: Report for the Department for Energy Security and Net Zero.

3 Department for Levelling Up, Housing, and Communities.

4 The only smart tariff currently doing this is Octopus 'Zero Bills' tariff.

5 Baringa proprietary analysis.

6 Ibid.

Emerging evidence suggests a house value increase of up to 16%. The commercial case for developers increasingly stacks up. Analysis by the Department of Land Economy at the University of Cambridge suggests a 16% value uplift for new-build homes with enough solar and battery storage to eliminate energy bills.[7] A further study of over five million existing properties indicates a 2-3% value increase for existing homes with solar panels or heat pumps (versus like-for-like gas-heated homes).[8] This more than offsets the extra investment in solar and heat pumps, so should reassure developers concerned about profit margins.[9]

Greater borrowing power. Lower energy bills free up disposable income, all else being equal, meaning people can potentially afford to responsibly borrow more. Banks are increasingly looking at whether cleantech homes could allow for responsible adjustments to mortgage affordability assessments. Mortgage providers are also recognising the financial and environmental benefits of lending to cleantech homes – and are launching innovative products to support them.

1.2 People like cleantech homes

There are huge health benefits. More than 20% of nitrous oxide (NOx) emissions in London come from gas boilers and cookers. Replacing gas with electricity therefore makes a substantial contribution to improving air quality and illnesses like asthma.[10] Heat pumps stop the problem getting worse and have a direct, positive health impact for occupants.

91% of people who switched to a heat pump are satisfied with its performance. This exceeds satisfaction rates for boiler users (74%) and busts myths that heat pumps aren't suitable for UK homes.[11]

Consumer interest in cleantech homes is growing. Since 2020, searches for 'solar panels' and 'heat pumps' on Rightmove's website have increased from the top 500 to the top 100, and from >1000th place to 200th.[12]

7 Hot Property – Valuing Zero Energy Bill Homes (2024), Cambridge University & ThinkThree.

8 ScottishPower and WWF (2023) Better Home, Cooler Planet. Analysis by the Department of Land Economy at the University of Cambridge.

9 Future Homes Hub (2023) Ready for zero: Evidence to inform the 2025 Future Homes Standard.

10 ECIU (2020) Analysis of gas boilers and NOx: The hidden emitter.

11 Censuswide survey of 2,894 Octopus customers for Baringa (June 2024).

12 Rightmove Data Services (2024).

1.3 Cleantech homes support supply chain and grid development

11,000 people qualified as heat pump installers in the last two years. With 40,000 heat pump training places available a year, industry is rapidly upskilling. This should be more than enough for new-build installations, which could hit 120,000 a year by 2028.[13] However, continued efforts are needed to meet maintenance demands and as retrofit installations increase. By the 2030s – assuming one million heat pump retrofits a year – we could need 14,200 full-time or 45,000 part-time installers given that many people will work across gas and heat pumps.[14]

Cleantech homes support power grid expansion. The inherent flexibility of electricity demand in cleantech homes can help manage challenges with grid connections. Electric vehicles can be charged at night when electricity demand is low, and hot water tanks can be heated with heat pumps outside of peak hours. There are examples of innovative best practice to manage the connection of new cleantech developments. For example, some developments have reduced connection capacities by 15% by taking advantage of flexible technologies like batteries.

1.4 We need urgent action to power the UK's cleantech revolution

Collaboration between industry and policymakers is vital to accelerate cleantech build rates. Key steps are being taken – but we need more momentum. The Future Homes Hub will take forward many of this report's recommendations together with the housebuilding sector and Government.

SMI Lighthouse Project members are stepping up. Recognising the pivotal role industry plays in the cleantech home transition, SMI Lighthouse Project members are making significant commitments – not just by contributing to this report, but by driving on-the-ground change and pledging to go further and faster. We encourage others to do the same. Member initiatives include:

- **Quickly phasing out gas.** Developers (The Hill Group and Bellway) and housing associations (Platform, Peabody, and Pobl) will stop installing gas boilers in new-builds – meeting or beating the estimated trajectory set out in the Future Homes Standard (FHS). For example, The Hill Group will stop selling gas-heated homes in 2024 (except homes connected to community heating).
- **Boosting affordability.** Octopus Energy is providing a 10-year 'Zero Bills' guarantee for homes with sufficient solar and battery storage.

13 Baringa proprietary analysis.
14 Ibid.

- **Building consumer awareness.** Rightmove is pledging to publish new educational content about cleantech homes and encourage estate agents to include more green terms in property listings.
- **Improving valuation.** The Royal Institution of Chartered Surveyors (RICS) requires valuers to consider all available evidence of sustainability-related property characteristics.
- **Innovating finance and mortgage offers.** Lloyds Banking Group is continuing to explore how it could evolve its mortgage affordability assessment to recognise the expected lower running costs of more energy-efficient properties.
- **Boosting high quality training.** Octopus Energy is pledging to train 72 clean heat apprentices. The Hill Group is pledging to collaborate with the National House Building Council (NHBC) and Microgeneration Certification Scheme (MCS) to develop training centres with heat pump programmes. The Future Homes Hub is conducting a detailed skills analysis to identify gaps in training.
- **Accelerating grid connections.** UK Power Networks will work with SMI Lighthouse Project members to build the case for the 5 kW 'connect and notify' standard for solar panels, making it easier to connect solar and increasing the amount of electricity homes can export to the grid. It is also reducing capacity requirements for heat pumps based on new energy consumption data.

Read the full list of SMI Lighthouse Project member pledges and initiatives in the appendix.

1.5 Recommended actions for policymakers

While there is policy to support cleantech homes, there has been stop/start progress over the last decade – and bolder action could help accelerate progress. This action should focus on:

- **Providing clarity on standards.** Clarity is urgently needed on the outcome and detail of standards to effectively ban gas boilers. This could be part of the new Labour Government's first 100-day plan. To maximise bill savings, it could include incentives to go beyond minimum standards for heat pumps and solar.
- **Increasing bill savings versus gas heating.** Policymakers should consider removing environmental levies from electricity, which would increase bill savings, and ensure electricity is not penalised relative to gas.
- **Supporting social rented and affordable homes.** To allow housing associations to navigate rent caps and strict valuation criteria that stop them recouping cleantech investments, Homes England could factor low-carbon technology costs into grant funding.
- **Increasing mortgage affordability and innovative finance.** Improvements to EPC methodology and sharing of data should be accelerated to give finance providers a reliable way of knowing which homes have cleantech.
- **Delivering quality training.** More generous retraining grants for sole traders and small and medium-sized enterprises (SMEs) could be provided to help grow the skills needed for new-build cleantech homes. Other incentives to encourage retraining and new entrants could be considered. A recognised training standard for heat pump installations should be created.
- **Enabling greater use of flexibility.** Locational pricing should be introduced. We need smooth delivery of the Market-wide Half-Hourly Settlement (MHHS) programme to enable flexible tariffs for low-carbon technologies.

See the summary of this report's recommendations for industry and policymakers on the next page.

1.6 The new-build sector can provide a roadmap for retrofit

Industry and policymakers cannot afford delays to the cleantech home transition. Continuing to build with gas boilers will cost homeowners around £4 billion in future retrofit costs and generate an additional 1.7 Mt of carbon dioxide.[15] Importantly, the new-build sector can act as a vital catalyst to boost the market for retrofit – by bringing down appliance and installation costs, improving data quality, raising consumer awareness, and building up supply chain capacity. This report sets out a roadmap for doing that.

15 Baringa proprietary analysis.

Recommendations for accelerating the cleantech home transition		
	Policy actions	**Industry actions**
Enhancing building regulations and increasing cleantech build rates	**Provide urgent clarity on the outcome and detail of the new standards for clean tech homes** with a call to all parties to include this as part of their plan for the first 100 days of the new Government.	Developers and housing associations should **accelerate the build of cleantech homes** as quickly as practically possible.
	Go beyond any minimum requirements for heat pumps and solar panels – and incentivise developers and housing associations to install larger solar systems and batteries (where practical), helping customers to save more money on bills.	**Share learnings** with relevant stakeholder groups and industry peers.
	Homes England to **factor the costs of installing low-carbon technologies** into grant funding criteria.	
Bolstering the financial case for homeowners	Set out a timeline to consult on **removing environmental levies from retail electricity bills**.	Lenders should **update mortgage affordability assessments** to recognise expected lower bills in more energy-efficient properties where it can be evidenced.
	Enable interoperability of low-carbon technologies and consistent connectivity standards.	**Introduce smart, time-of-use tariffs and enable interoperability** of low-carbon technologies so homeowners can use equipment at the lowest cost.
	Accelerate improvements to EPC scoring methodology to better incentivise heat pump installations.[16]	

16 UK Government (2024) Closed Consultation: Home Energy Model: Future Homes Standard assessment.

Recommendations for accelerating the cleantech home transition		
	Policy actions	**Industry actions**
Increasing consumer awareness of cleantech home benefits	Work with industry to promote the health benefits of cleantech homes.	**Collaborate with policymakers to raise public awareness** of the benefits of cleantech homes.
		Make information about low-carbon technologies **more accessible**.
Expanding skills and supply chain capacity	**Continue measuring and monitoring supply chain skills gaps** to ensure an adequate workforce.	**Incentivise existing suppliers to retrain staff** in low-carbon technology installations.
	Providing more generous retraining grants and incentives for sole traders and SMEs.	**Invest in training for the wider real estate industry**, such as estate agents, so they can effectively inform householders.
	Create a recognised industry training quality standard for new-build heat pump installations.	**Ensure training is delivered to recognised standards.**
Expediting grid connections	**Ensure smooth delivery of the Market-wide Half-Hourly Settlement** programme to enable more flexible usage tariffs for consumers with low-carbon technologies.[17]	**Distribution network operators should take a more data-led approach** to connecting new homes to enable more efficient and lower-cost connections.

17 Market-wide Half-Hourly Settlement is now due to be implemented in December 2026 and should enable much wider roll-out of time-of-use tariffs, which will incentivise behaviour that reduces energy costs.

WHAT IS

A CLEANTECH HOME?

Sustainable Markets Initiative

Cleantech homes have **electric heating systems**, like heat pumps. They are **not connected to the gas grid** and **do not use any other fossil fuel** for heating. They can also go further than just electric heating, for example with an **electric vehicle charger** or **solar panels** and **batteries**. These homes are 'net-zero ready' – as they only have electric appliances, the energy they use will be carbon-free once the National Grid achieves its 100% clean electricity target.

1 HEAT PUMP
Electric heat pumps generate heat and hot water from electricity and are highly efficient compared to conventional gas boilers

2 SOLAR PANELS
generate clean renewable energy to help reduce energy bills and carbon emissions

3 BATTERY STORAGE
increases the efficiency of the PV array, offers energy cost savings and a backup power source, and reduces the burden on our grid infrastructure

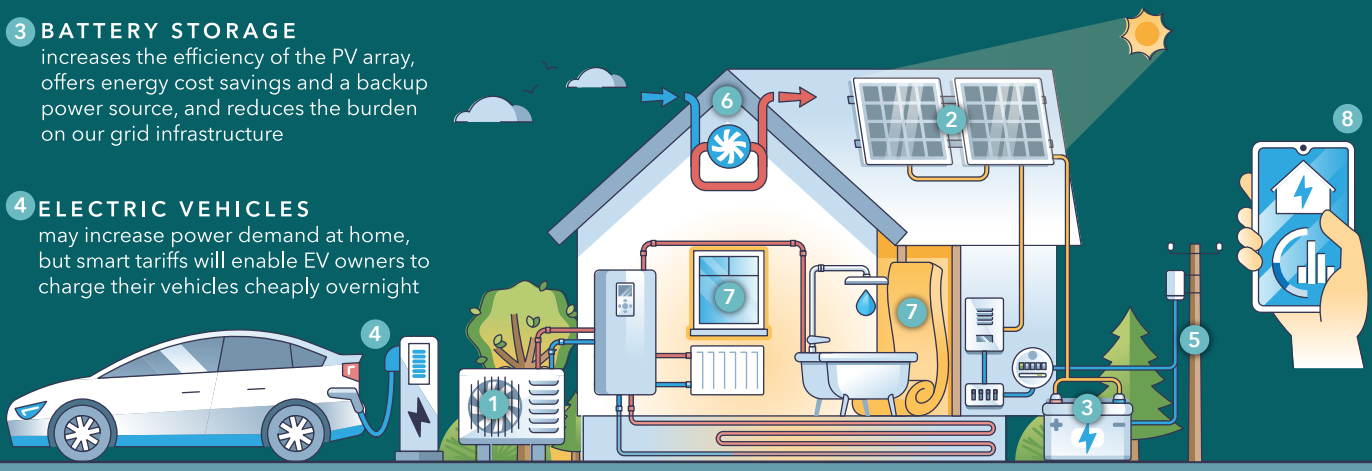
4 ELECTRIC VEHICLES
may increase power demand at home, but smart tariffs will enable EV owners to charge their vehicles cheaply overnight

5 NO GAS CONNECTION
connects to a rapidly decarbonising National Grid, or a decarbonised local electric microgrid network

6 HEAT RECOVERY
recovers heat from stale air and transfers it back as fresh, warm air, improving air quality and reducing wasted heat

7 FABRIC ENERGY EFFICIENCY
High performance glazing, insulation and airtightness minimise heat loss and use far less energy for heating and cooling

8 SMART HOME HUB
allows smart-enabled low carbon technologies to be run most efficiently to respond to price signals



POLICY LANDSCAPE

UK POLICY (BY COUNTRY)

SCOTLAND
Introduced ban on direct-emission heating systems in new homes and buildings (New Build Heat Standard, April 2024)

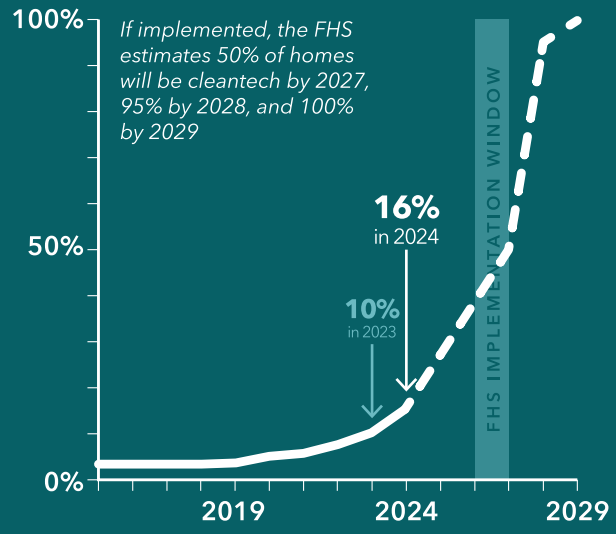
NORTHERN IRELAND
No timeline yet for phasing out gas boilers in new homes

ENGLAND
Effectively mandated the end of gas boilers in new homes from 2026 onwards (The Future Homes Standard)

WALES
Banned gas boilers in new social homes in 2021. Currently consulting on whether to extend this to private developments from 2025

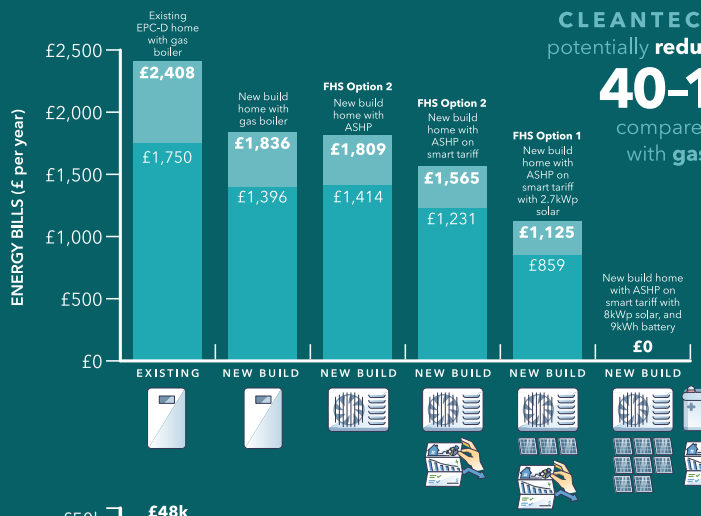
11,000 people qualified as heat pump installers in the last **TWO YEARS**

CURRENT AND PROJECTED RATE OF NEW HOUSES AND FLATS BUILT WITH HEAT PUMPS



Over one-third of new homes built today have some form of **electric heating**

THE BENEFITS

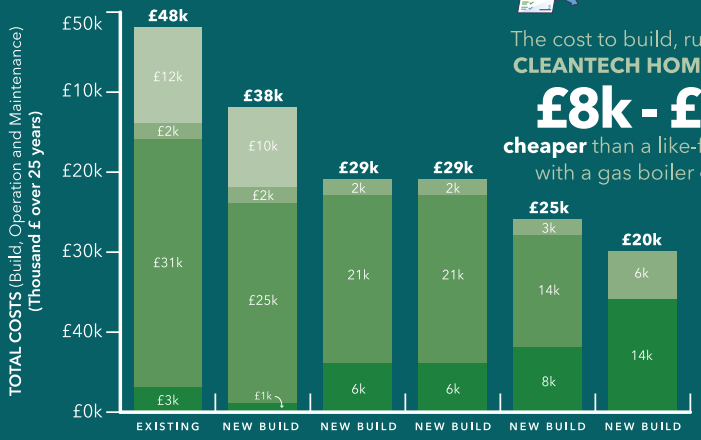


CLEANTECH HOMES can potentially **reduce energy bills** by

40–100%

compared to homes with **gas heating***

**Figures are based on Baringa's analysis of projected household energy costs between 2024 and 2027 for comparable three-bed, semi-detached, gas-heated homes*



The cost to build, run and maintain a **CLEANTECH HOME** could be up to

£8k - £18.5k

cheaper than a like-for-like new home with a gas boiler **over 25 years**

CONSUMER PERCEPTION

OVER 80%

OF PEOPLE

who recently switched to a heat pump stated that they were satisfied or more than satisfied with their **new heating system**

USER SATISFACTION

91% of people we surveyed reported being **satisfied with their heat pump** vs. for **boiler users** **74%**

EFFECTIVENESS

90%

of both heat pump and boiler users stated their heating systems **did a good job** of maintaining desired temperature levels during **winter**

THE COMMERCIAL CASE

Low-Carbon Technologies

DO cost more to install, but these costs amount to **LESS THAN 2%** of the new home's **sale price**

-30%

Over the next 10 years, heat pump costs are expected to **REDUCE BY 30%**, while **solar PV costs** will **REDUCE BY 40%**

-40%

'SOLAR PANELS' is now in the **top 100** most-searched keywords on Rightmove, while **'HEAT PUMPS'** has also surged to the **top 200** in 2024

DEVELOPERS

are **reducing the size of electricity connections** needed by **UP TO 15%** by taking advantage of smart and flexible assets to **optimise energy network use**, and a data-led approach to **sizing grid connections**

LENDERS

are increasingly incentivising investment in **CLEANTECH HOMES**

1. It helps them meet their **NET ZERO COMMITMENTS**
2. **LOWER ENERGY BILLS** free up disposable income for borrowers
3. **CLEANTECH HOMES** are more likely to hold value in the long term because they are **NET-ZERO READY** and **do not need retrofitting** to meet future emissions standards

A RESILIENT INVESTMENT

Emerging evidence suggests that **LOW-CARBON TECHNOLOGIES** can **add value** to the average home

HEAT PUMP	**+1.7 - 3%**
SOLAR PANELS	**+0.5 - 2%**
EV CHARGER	**+2 - 2.75%**
ZERO BILLS***	**+16%**

****A 'Zero Bills' home is one that meets a 'Zero Bills' specification for solar panel system peak power, battery storage capacity, and has a heat pump, and is therefore eligible for the 'Zero Bills' tariff*

READ THE FULL REPORT

Cleantech Homes:
Lower Bills, Healthier Living (2024)

Infographic design by Savills Earth

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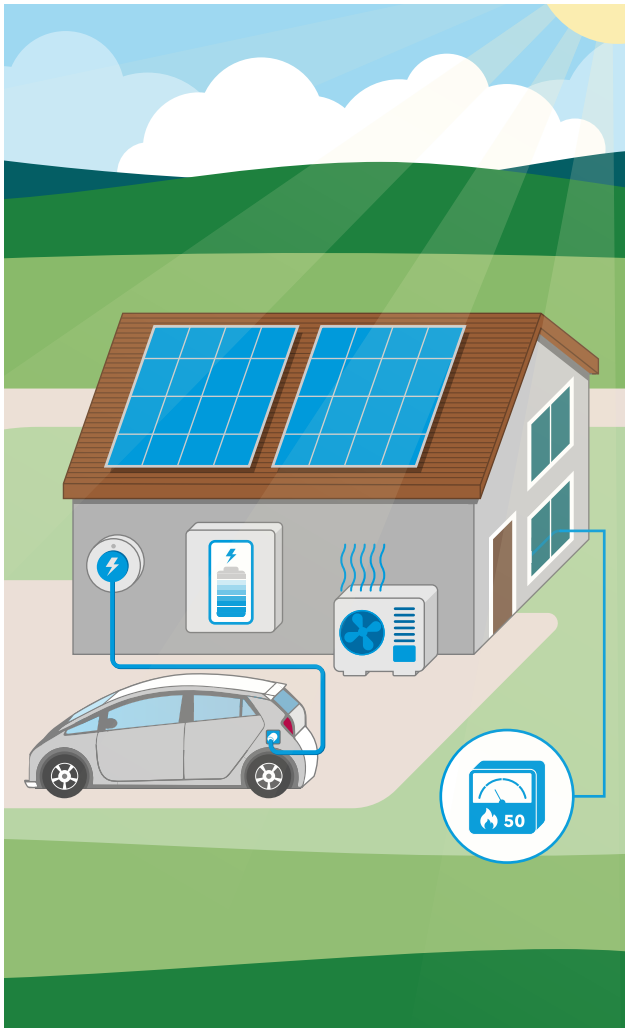
2. Introduction

Cleantech homes are set to play a vital role in the transition to a net-zero economy.[18] With around 18% of the UK's total carbon emissions coming from domestic heating, decarbonising the UK's existing and future housing stock is a crucial step towards a greener future.[19]



Household electrification will usher in a brighter future for our planet and a positive change in how we live. Not only are cleantech homes cheaper to run when operated efficiently on smart energy tariffs, but people find them more comfortable to live in – and they improve health and wellbeing. These homes could also deliver commercial value for developers and lenders, with evidence emerging of sale price premiums for properties with lower bills and low-carbon technology installations. The shift to alternate sources of heating (like heat pumps) and more sustainable energy sources (like from solar power) will deliver significant societal benefits and accelerate the much-needed move to cleantech homes.

2.1 What is a cleantech home?

At a minimum, cleantech homes have electric heating systems like heat pumps. They are not connected to the gas grid and do not use any other fossil fuel for heating. They can also go further and have solar panels that give occupants free, renewable energy from the sun as well as batteries to help store excess solar power or electricity imported from the grid when prices are low. This stored energy can then be used later in the day when electricity prices are highest.

Cleantech homes are 'net-zero ready' because the electricity they consume reflects the grid's carbon intensity – and the new Labour Government has pledged to achieve a 100% renewable and clean energy grid by 2030.[20]

18 The term net-zero is used in this report to refer to the UK's legally binding commitment to achieve a 100% reduction of greenhouse gas emissions by 2050 compared to 1990 levels (including schemes to offset an equivalent amount of greenhouse gases from the atmosphere).

19 Department for Energy Security and Net Zero (2024) Decarbonising home heating.

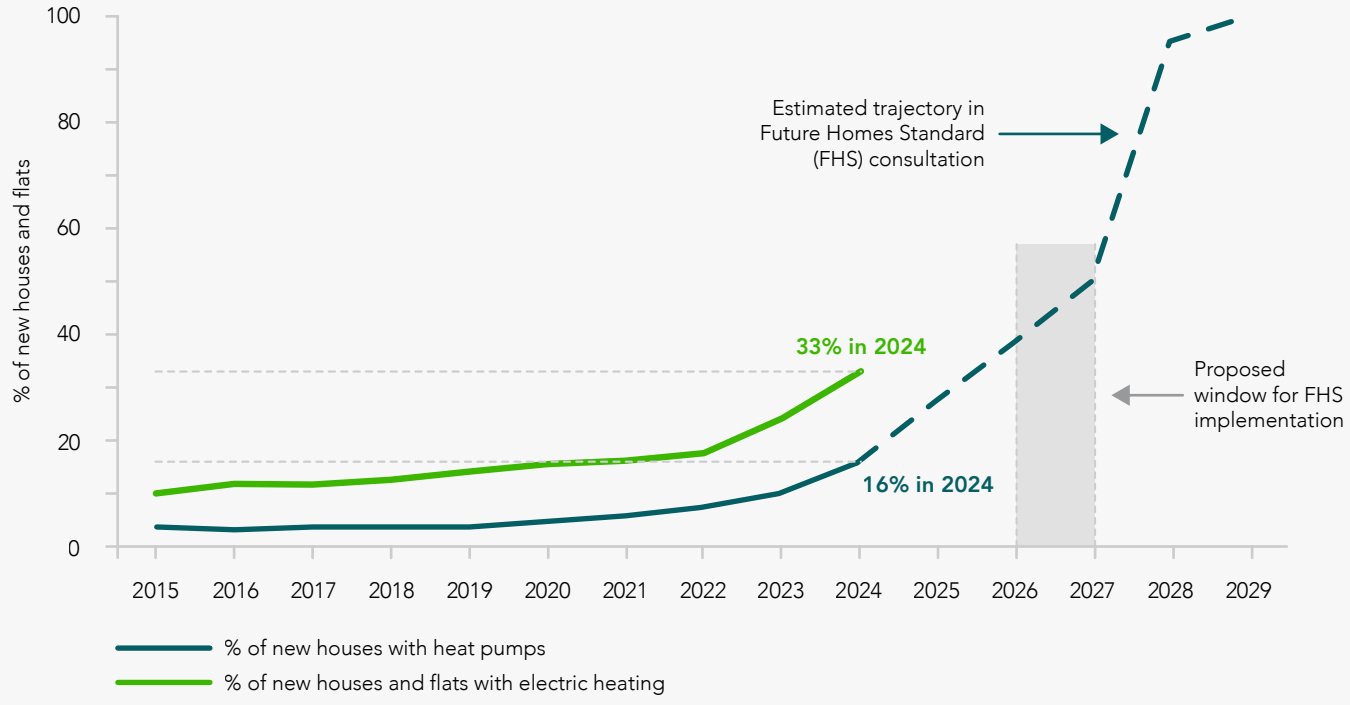
20 https://labour.org.uk/wp-content/uploads/2024/03/Make-Britain-a-Clean-Energy-Superpower.pdf

2.2 Developers are stepping up cleantech home build rates

There has been a big increase in the number of heat pumps installed in new homes in the last few years, however, there is still a long way to go to eliminate fossil fuels in new-build homes.

Over a third of new dwellings built today (in England and Wales) have some form of electric heating, up from 17% in 2020 – although the majority of this is electric heaters in new-build flats. Considering new-build houses only, 10% had heat pumps in 2023 and 16% had heat pumps as of April 2024 (see Figure 1).[21]

Figure 1: Current and projected rate of new houses and flats built with electric heating



Some developers like The Hill Group have already committed to ending sales of new homes with gas boilers in 2024 (except when mandated by the local authority to connect to gas-based community district heating schemes).

21 Department for Levelling Up, Housing, and Communities.

Case study

The Hill Group: Colville Road

In partnership with Cambridge City Council, we delivered much-needed affordable housing, replacing poor-quality homes with a highly sustainable development. A sustainability review was carried out with external consultants, considering resident reviews to make sure we exceeded their energy requirements.

The development has delivered:

- Gas-free housing and extensive green biodiverse roofs
- Permeable paving and sustainable urban drainage integrated into landscaping
- Approximately 15% savings on energy costs for the average tenant through fabric enhancements and communal air-source heat pumps
- Reduced energy demand and carbon emissions through mechanical ventilation heat recovery
- Lower heat loss and energy bills thanks to wider cavity walls filled with denser insulation

The development achieved a 57% carbon reduction versus the original design with gas heating – and only cost 6% more. It was still completed for less than the council's original budget.[22]

"We recognise the critical role cleantech homes play in safeguarding the future of the environment. While sustainable features may currently add a small premium to build costs, we're confident that as volumes rise, these technologies will become more affordable. We're proud to be at the forefront of this movement, developing the next generation of sustainable homes for a cleaner, greener future. This isn't just good business, it's ensuring a healthier planet for generations to come."

Andy Hill OBE, Group Chief Executive, The Hill Group

22 Colville Road case study provided by The Hill Group (2024).

2.3 The regulatory backdrop

Clearly, regulation has a hugely important role to play in eliminating fossil fuels from new-build homes. Given the progress being made across industry to prepare for and build cleantech homes, policymakers can now confidently regulate to end gas boiler installations in new homes – while at the same time helping people save money with low-carbon technology.

Across the UK, there is mixed progress on mandating cleantech homes. In England, regulation was proposed by the last government through the Future Homes Standard (FHS) to effectively mandate the end of gas boilers in new homes from 2026 onwards by improving building standards for new homes and decarbonising the way buildings are heated.[23] The proposed regulations had options to include solar and higher fabric efficiency standards. The consultation has closed, and there will be a decision for the new Government on how to progress these regulations. If implemented, the FHS estimates 50% of homes will be cleantech by 2027, 95% by 2028, and 100% by 2029.

Scotland introduced a ban on direct-emission heating systems like oil and gas boilers in new homes (and buildings) via the New Build Heat Standard, which came into effect from April 2024. Wales effectively banned gas boilers in new social homes in 2021 and is currently consulting on whether to extend this to private developers from 2025. Northern Ireland, being a rural area with significant numbers of people off the gas grid, has not yet set a timeline for banning gas boilers in new homes.

It is important the Government doesn't delay implementing new standards for cleantech homes, and that industry takes proactive action to ensure they implement new regulations as quickly as possible

Industry needs urgent clarity on the outcome and detail of new standards for clean tech homes to allow for sustainable planning cycles. This could be part of the new Government's plan for the first 100 days. Providing this clarity will level the playing field for all developers and accelerate the transition. Any delay will push back the effective end date for gas boilers, which, as the rest of this report sets out, we cannot afford to do. Having implemented these standards, policymakers could then consider how and whether to go further by further increasing standards later down the line. The new Labour Government's manifesto pledge to make 'exemplary development the norm not the exception is welcomed.

23 The Future Homes Standard (FHS) is a policy proposed by the previous Government that would introduce a change to Part 6, Part L, and Part F of the Building Regulations for dwellings in England. It will effectively ban the installation of gas boilers in new homes. It is currently planned for implementation from 2025. The consultation closed in March 2024 and is now being considered. A key element still to be confirmed is whether it will mandate heat pumps only (Option 2) or heat pumps plus solar panels, wherever practical (Option 1). Despite the planned introduction of legislation in 2025, a six- to 12-month period before the full technical standard comes into force (as well as a 12-month transitionary period) could still see new homes with gas boilers built up until 2029 or 2030.

Given the strong commercial case and compelling evidence on health benefits for cleantech homes – which we discuss in later chapters – **we urge all housing developers to beat the trajectory estimated in the FHS consultation for implementing the new standards and end the installation of gas boilers in new homes as soon as practically possible.**

Focus of the report

The rest of this report looks at the key factors that should support the acceleration of the build and delivery of cleantech homes:

- The financial benefits for householders, including bill savings and lifetime costs of ownership;
- The commercial benefits for developers and builders, including sales price increases;
- Wider health benefits for cleantech home occupants;
- Householders satisfaction with heat pumps and interest in clean tech homes;
- A new market for 'green mortgages';
- The rapidly growing skills and supply chain;
- Speeding up electricity grid connections for cleantech homes; and
- A roadmap from new-build to retrofit.

3

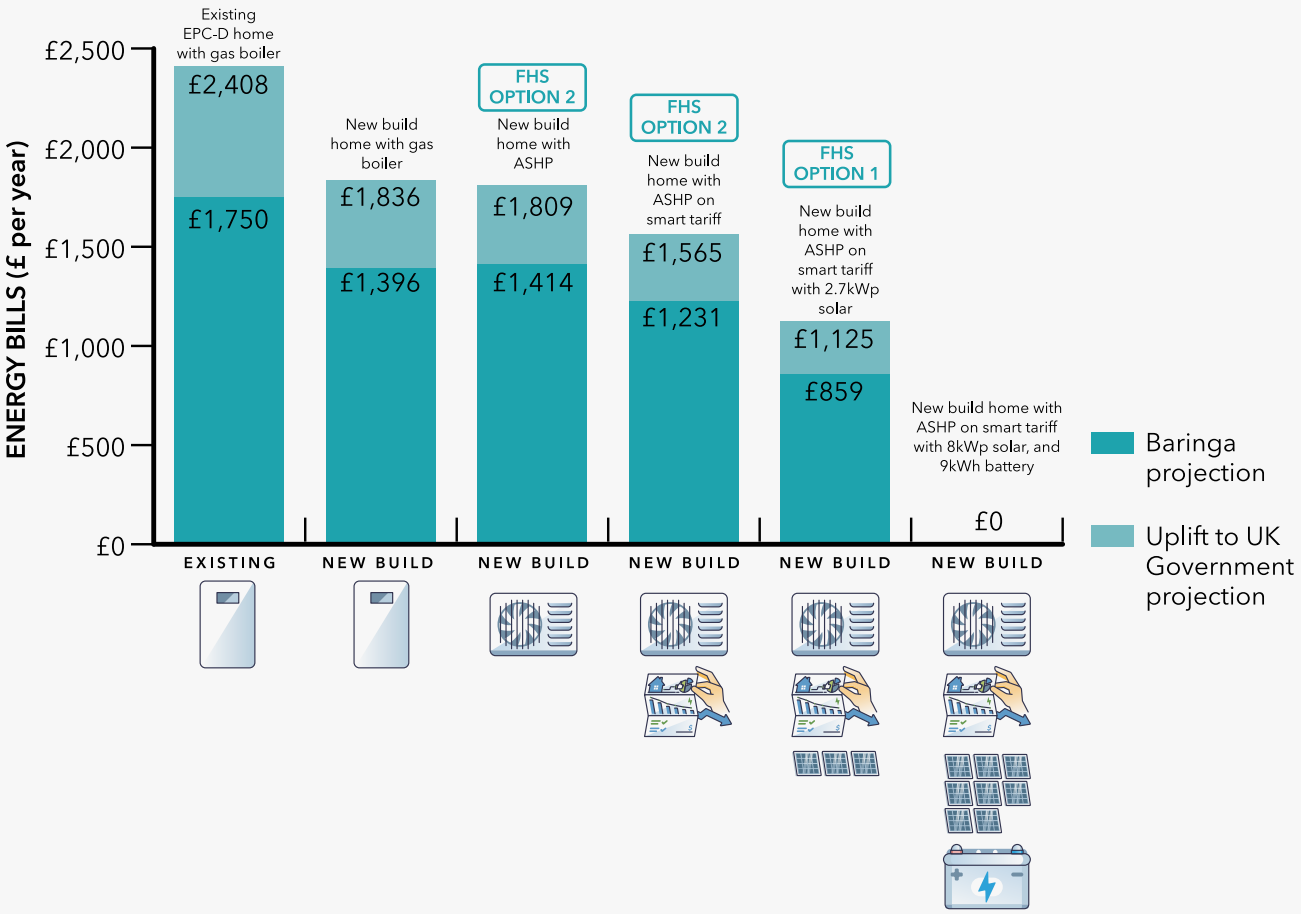
3. There is a big financial benefit for homeowners: *Heat pumps, smart tariffs, and solar panels can reduce bills*

Key takeaways:

- All new-build cleantech homes should see lower energy bills compared to both existing and new-build homes with gas heating. There is the potential for a 40-100% reduction in bills from day one.
- These savings are greatest when a heat pump is used with solar panels and a battery storage unit, and operated efficiently on a smart heating tariff.
- Homeowners should still see savings even if housebuilders pass on the additional cost of installing low-carbon technologies in the sale price. This is because energy bill reductions over the long term more than offset the additional capital outlay.
- Removing environmental taxes and levies from electricity bills would further improve the economics of electric heating for consumers. Electricity is around four times more expensive than gas on a unit rate basis, and addressing this imbalance is key to enabling more uptake of cleantech homes.

3.1 Up to 40% reduction in energy bills from day one – with the potential for £0 bills

Figure 2: Indicative projection of average household energy bill for a 3-bed semi-detached home between 2024-2027



New-build cleantech homes with heat pumps and solar panels built to the previous Government's proposed new standards for cleantech homes can be 40% cheaper to run than like-for-like homes with gas boilers, saving occupants £700 a year. These homes have heat pumps, a medium sized solar array, and they would be operated on smart tariffs to capture the bill savings. Savings can increase to around £1,300 (or 53%) per year when compared against typical existing like-for-like gas-heated homes (see Figure 2).[24,25]

24 Baringa proprietary analysis. A range of potential future energy prices is considered. The lower range represents Baringa's proprietary projection, which starts at the Ofgem price cap rate that came into effect in April 2024 and continues in line with live forward energy prices as of May 2024. The higher projection (shown as the lighter-green bar on Figure 2) is based on the UK Government's latest retail energy price projection. Energy demand assumptions are based on a new-build, three-bed semi-detached home over the period 2024-2027. The smart tariff discount is based on various current supplier offerings, which typically give around 40% lower unit rates for heat pump usage. Please see the appendix for a full list of modelling assumptions.

25 The FHS is consulting on whether to mandate 2.7-kWp solar arrays in combination with heat pumps. This is the solar capacity referenced here.

Installing solar panels is critical to maximising bill savings.

Ultimately, upping the number of solar panels and installing a larger battery in conjunction with a smart tariff can even generate and store energy such that a home's total energy bill can be fully offset. Octopus Energy, in partnership with some of the UK's leading housebuilders like Bellway and The Hill Group, now offers a 'Zero Bills' proposition for a heat pump, 8-kWp solar array (versus the 2.7kWp specified in the FHS consultation), and a 9.5-kWh battery storage unit.[26] These larger assets mean a home can generate and store enough energy to fully offset its bills.

These figures are based on our analysis of projected household energy costs between 2024 and 2027 for comparable three-bed, semi-detached, gas-heated homes.

Smart controls and tariffs are also key to minimising energy bills

As well as including solar panels in new builds, enabling householders to take advantage of smart tariffs and smart controls is fundamental to helping them get the best prices when using their low-carbon technologies.

A range of smart tariffs for heat pumps is currently available from suppliers like OVO Energy, Octopus Energy, and EDF Energy. These typically give a 40% discount on the unit rate of electricity consumed for heat pump usage out of peak hours. There are also smart tariffs that help householders optimise savings and income from solar and batteries. Smart controls such as solar diverters are also key to reducing bills for those with solar panels. Solar diverters enable consumers to make the most of solar energy and use it most efficiently because they divert excess energy into heating systems rather than exporting to the grid, when the export price is lower.

Greater smart tariff and smart control penetration among a broader set of suppliers will help customers access lower prices. The introduction of market reforms like half-hourly settlement in the residential electricity market is essential to incentivising smart tariffs. Introducing zonal pricing to the GB electricity market, so that local prices reflect the cost of producing and transporting energy across the day, would further reduce bills by making the overall energy system more efficient and helping people use energy when it is cleanest and greenest. Cleantech homes will stand to benefit as they can store energy and use it when there's less wind on the system and prices are higher.[27]

26 kWh is a unit of energy.

27 DESNZ (2024) Review of Electricity Market Arrangements, Options Assessment

3.2 Looking at the total cost of ownership, savings could reach £18,500 over 25 years

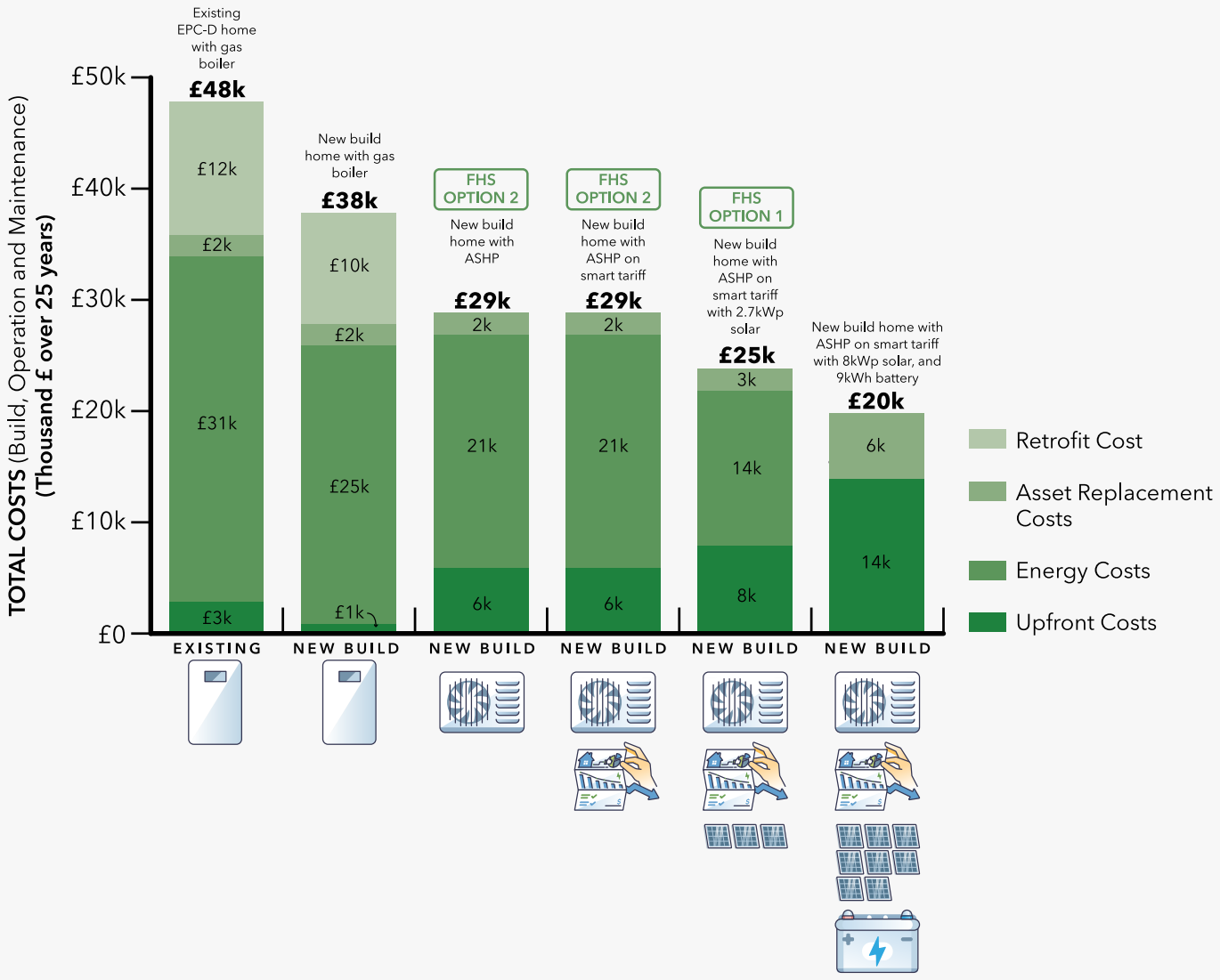
Our research busts a common myth about cleantech homes: that people won't save enough to justify the capital costs. In fact, while it does cost more to build a cleantech home – and therefore potentially more to purchase one – the additional cost to build (if passed on in a higher sales price) is more than offset by bill savings over time (for example, over a 25-year mortgage term). So not only do cleantech homes provide lower bills from day one, but they also make financial sense over the long term for consumers.

Analysis for this report shows a new-build home with a heat pump and solar panels (FHS Option 1) – including costs of equipment, maintenance, and one replacement – could be around £2,500 cheaper than a like-for-like new-home with a gas boiler (see Figure 3) over 25 years.[28] While the upfront costs of the heat pump and solar panels are higher, the annual bill savings of around £600-£700 a year mean the cleantech home has a lower total cost.[29]

28 25-year savings increase to around £5,600 if using the Government's central long-term energy price projection, which assumes a higher wholesale gas price than Baringa's projection. Source: DESNZ Green Book supplementary guidance: Valuation of energy use and greenhouse gas emissions for appraisal (Tables 4-8).

29 The analysis assumes all assets are replaced once during the 25 years, and that the asset replacement cost is the same for the boiler and heat pump (due to assumed cost reductions of heat pumps after 12 years). There is also a small cost to replace the solar inverter after 12 years. See the appendix for more detailed modelling assumptions.

Figure 3: Indicative 25-year total cost of ownership



As mentioned above, more ambitious new-build cleantech homes, with larger amounts of solar and a battery can even be designed so they have no energy bills at all. Despite the greater upfront additional cost, they have an estimated net saving of £8,500 versus a comparable new gas-heated home over 25 years, or £18,500, using the Government's projection for energy prices. And, this saving includes the additional initial cost, one asset replacement (for each low carbon technology), and running costs.[30,31]

30 Baringa proprietary analysis based on Baringa's long-term retail electricity price projection. A 2% annual discount rate (long-term Bank of England inflation target) has been used in Figure 3. If HM Treasury's Green Book annual discount rate of 3.5% is assumed, the heat pump and solar savings reduce from £2,500 to around £800, and the larger solar and battery configuration savings reduce from £8,500 to £4,900. The Government's latest price projections are also included to show a range. Its long-term gas price projection is significantly higher than Baringa's, so it shows greater savings for cleantech homes. Please see the appendix for a full list of modelling assumptions.

31 Savings for the 'Zero Bills' configuration increase from £8,500 to £18,500 when using the Government's central energy price projection.

This analysis suggests that home buyers would be financially better off, even if developers increased the sale price of cleantech homes by the total additional cost of these technologies (relative to a comparable gas-heated home).

Avoiding future retrofit costs make the financial case even more compelling

The retrofit risk for homes with gas boilers adds to the benefit case for cleantech homes (see Figure 3). Within 25 years, the vast majority of homes with gas boilers will need retrofitting to low-carbon heating systems like heat pumps in order to meet the UK's 2050 Net Zero target.[32] And it is more expensive to retrofit a home with a heat pump than install one in the first place. Accounting for these retrofit costs – which are estimated at £10,000-£12,000, or £7,500-£9,500 assuming that replacement occurs when people need to replace their boiler anyway – a new-build, gas-heated home looks even more expensive over the long-term than a cleantech one that already has a heat pump or other form of low-carbon electric heating.[33]

32 UK Government (2023) Heat and buildings strategy.

33 Eunomia (2024) Cost of domestic and commercial heating appliances: A report for the Department for Energy Security and Net Zero (Figure 3.1).

3.3 How SMI Lighthouse Project members are helping increase the financial benefits

The Hill Group, Bellway, Platform, Peabody and POBL are all committing to increase build of cleantech homes, including those which qualify for no energy bills, helping consumers secure increased financial benefits.

Octopus Energy is committing to work with low-carbon technology manufacturers to ensure its products are smart-enabled and can work with smart tariffs. It is also reaching out to industry to develop a common set of standards for device interoperability. To further support the financial case for cleantech homes, it is committing to extend its 'Zero Bills' homes guarantee to 10 years from the current guarantee of five years.

3.4 Recommended actions for increasing the financial benefits

While bill savings are very positive for householders with cleantech homes, it is possible to improve the economics to further incentivise uptake and support the business case for retrofit of the existing housing stock.

Remove green levies from electricity rates to unlock major savings. Consumers could see significant additional bill savings if policymakers removed environmental levies from electricity bills and charged them via other means (levies account for around 25% of customers' electricity bills while none are recharged on gas bills).[34] With electricity unit rates currently around four times higher than gas rates, and as electrification of heating and transport is the primary way to achieve net-zero, it is counterproductive to tax electricity users so heavily. Policymakers should establish a timeline for reviewing the charges levied on electricity tariffs to encourage the uptake of low carbon technologies in both new and existing homes.

Promote solar panels alongside heat pumps to improve uptake. Given the compelling commercial case for combining heat pumps with solar panels and batteries, we urge **developers** to include solar in house designs. Even if they only offer it to homebuyers as an optional extra, they could explain the savings that solar panels could deliver. We also call on **policymakers** to ensure the outcomes of the FHS consider, as a minimum, how to incentivise the inclusion of solar panels.

34 Ofgem breakdown of electricity bills.

4

4. The commercial case for developers increasingly stacks up: *There is emerging evidence of value premiums for cleantech homes*

Key takeaways

- There is emerging evidence that homebuyers value cleantech homes more highly than comparable gas-heated homes.
- This points to a win-win scenario for developers, who can at least recover the additional build costs, and for homebuyers, whose homes will cost less to run.
- However, the business case for housing associations can be less viable due to the classic tenant-landlord incentive challenge – the landlord who invests the additional capital upfront does not benefit from the bill savings. And, with regulated rent caps, housing associations often have little flexibility to increase rents to recover additional build costs.
- To support housing associations to build more cleantech homes for their customers, a deeper conversation needs to be had at all levels of government and with Homes England, to ensure incentives are enabling business cases that support greater build of affordable cleantech homes.

4.1 Cleantech costs less than 2% of the sale price – and can be passed on without removing the benefits to consumers due to bill savings

Low-carbon technologies do cost developers more to install, but these costs amount to less than 2% of a new home's sale price. And, buyers are likely to be better off due to bill savings, meaning both developers and consumers benefit – even if these costs are fully passed on.

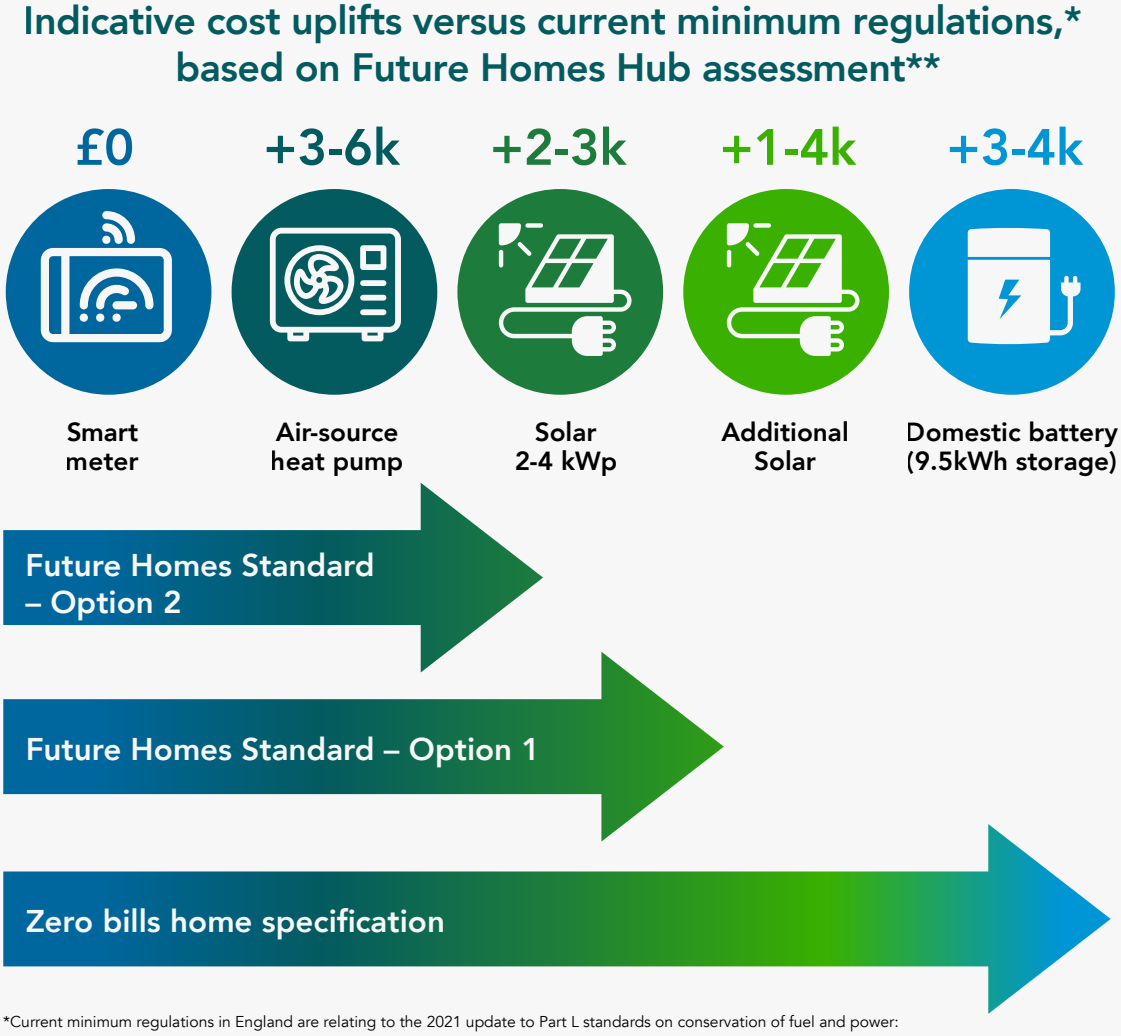
The Future Homes Hub has estimated that additional capital cost to build a new three-bed semi-detached home with a heat pump and solar panels (FHS Option 1) versus with a gas boiler is around £7,000-8,000 (see Figure 4).[35] This represents an uplift of only 1.8% on the average price of a new-build home, which is around £400,000.[36] Some developers, such The Hill Group, have already reduced costs significantly below this. The Hill Group estimates an additional cost of £4,000-£5,000 to build with a heat pump and solar panels versus a gas boiler.[37]

35 Future Homes Hub (2023) Ready for Zero: Evidence to inform the 2025 Future Homes Standard.
36 ONS UK house price data.
37 The Hill Group proprietary cost estimates.

There are good reasons to be optimistic about low-carbon technology costs coming down for all developers. The price of renewable energy has fallen significantly over the past decade (see Figure 5) and should continue to fall.[38] Heat pump and solar panel costs will continue dropping as supply chains mature and become more integrated. In the next 10 years, heat pump costs are expected to reduce by 30% and solar PV costs will reduce by 40%.[39] We believe this is a conservative estimate for heat pumps, and that costs will fall further as industry achieves scale.

However, the initial outlay presents a barrier to some developers and housing associations who are concerned about the additional costs eating into their returns.

Figure 4: Additional low-carbon technologies do cost developers more



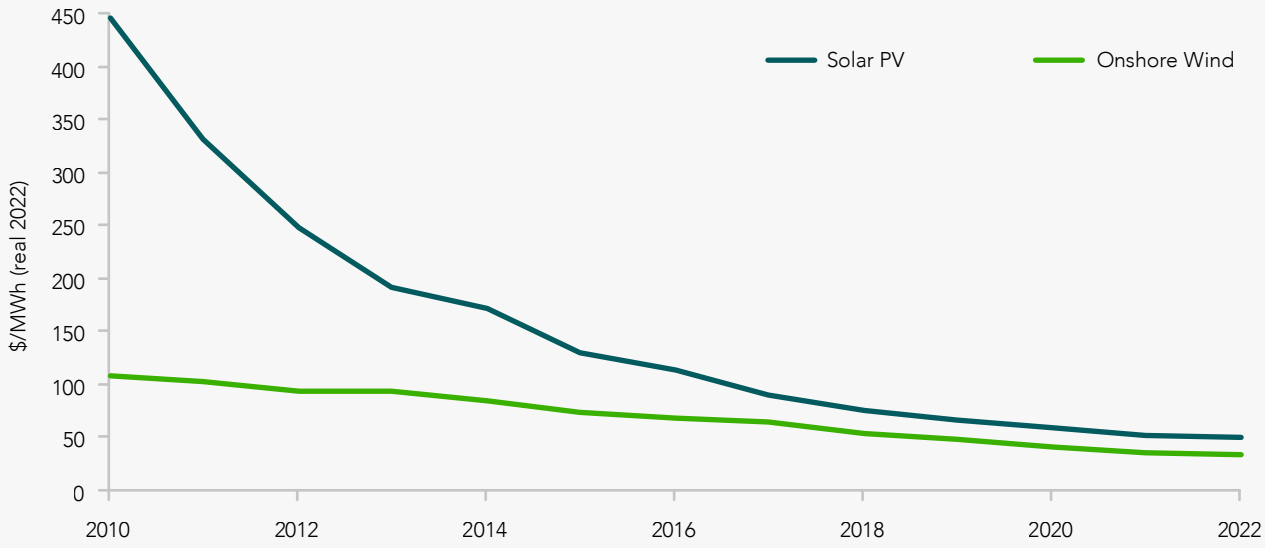
*Current minimum regulations in England are relating to the 2021 update to Part L standards on conservation of fuel and power: https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

**Future Homes Hub (2023): Ready for Zero, Evidence to inform the 2025 Future Homes Standard (placeholder citation)

38 International Renewable Energy Agency, Abu Dhabi (2023) Renewable power generation costs in 2022.

39 Department for Levelling Up, Housing, and Communities (2023) The Future Home Standard: Consultation-stage impact assessment Currie and Brown study.

Figure 5: Levelised costs of renewable technologies



4.2 Emerging evidence suggests house values could increase by up to 16%

Given the increased upfront investment, on a simple cost basis, some developers might consider it better to leave the heat pump transition to the last possible moment under regulation. However, there is emerging evidence of value premiums for energy-efficient homes that have lower running costs and low-carbon technology.

Analysis by the Department of Land Economy at the University of Cambridge (commissioned by ScottishPower and WWF) reviewed over five million existing homes. The results suggest that low-carbon technologies can add value to the average home. They found that:

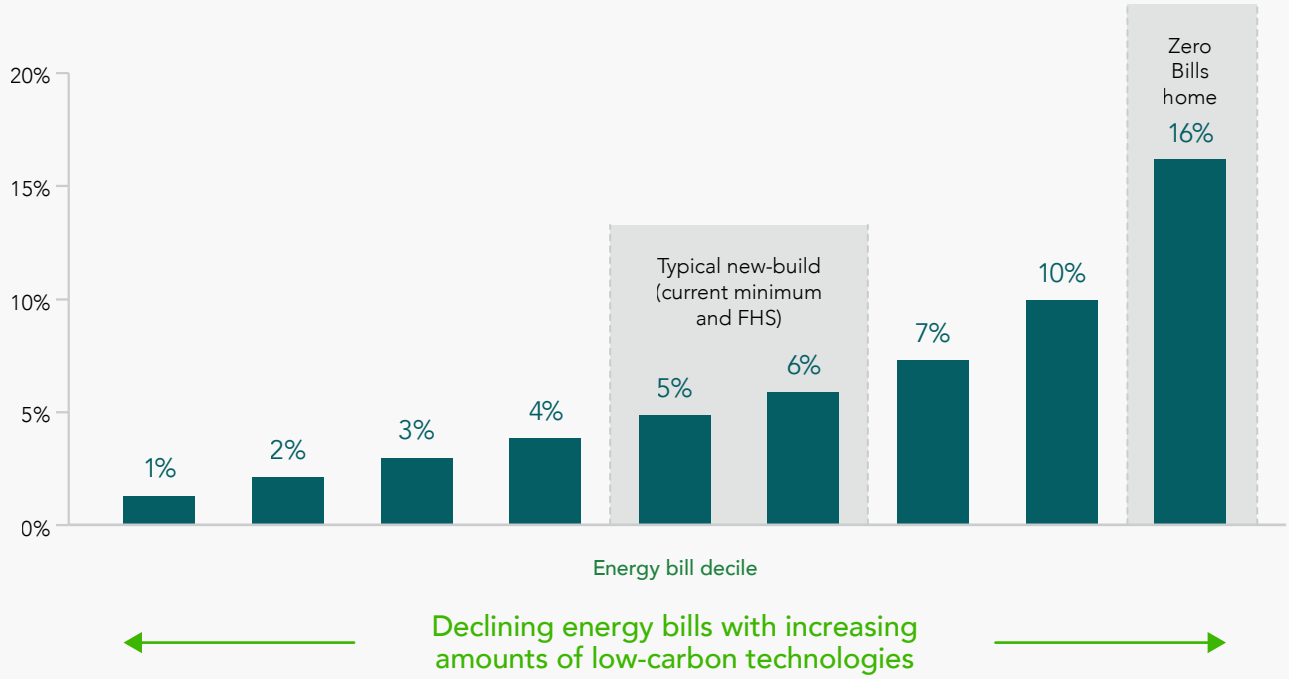
- Heat pumps can add £5,000-8,000 (1.7-3.0%)
- Solar PV can add £1,350-5,400 (0.5-2.0%)
- EV charging points can add £5,400-7,400 (2.0-2.75%)[40]

Another recent study of five million property transactions by the same University of Cambridge team (commissioned by Octopus Energy) identified a strong correlation between increasing house price value and lower energy bills. The analysis suggests a price premium of up to 16% for 'Zero Bills' homes and a 5-6% premium for new homes built to current standards (versus comparable existing homes) see Figure 6.[41]

40 ScottishPower and WWF (2023) Better homes, cooler planet. The analysis considered five million existing homes between 2007 and 2023.

41 Hot Property – Valuing Zero Energy Bill Homes (2024), Cambridge University & ThinkThree. This hedonic regression analysis controlled for multiple variables to isolate the impact of energy bill savings on value uplifts.

Figure 6: Percentage value uplift based on reduction in energy bills



In its UK residential market survey of property market participants, RICS has also seen increasing indications that sellers are attaching premiums to more energy-efficient properties.[42] In February 2024, 43% of survey respondents stated that sellers were looking to attach a premium to more energy-efficient homes. Additionally, 37% said that homes with greater energy efficiency were holding their value in the current market (relative to less energy-efficient homes). This is supported by a Rightmove study looking at 300,000 existing homes, which suggested people are willing to pay £56,000 more for a home that has been retrofitted from EPC F to EPC C.[43]

Housing associations face specific commercial challenges in offering cleantech homes

Housing associations are keen to build ambitious volumes of low-carbon homes because of the benefits these homes give their customers in terms of bill saving, helping with the cost of living, and health outcomes. And the opportunity is substantial: 25% of all new homes are built as affordable housing.[44]

42 RICS (February 2024) UK residential market survey.

43 The analysis was based on c300,000 properties that have sold twice in the last 15 years and had a new EPC rating issued, showing a 15% value increase when moving from an F to a C (£56k at average asking prices). The analysis adjusted for localised house price movements as well as for home size (square foot) changes that may increase the value. It did not adjust for home improvements like refurbishing a kitchen.

44 Department for Levelling Up, Housing, and Communities.

However, the business case for installing low-carbon technology in affordable housing is more complex – and can be more challenging to stack up financially – than in the private sector. Housing associations have to carefully balance affordability for their customers while ensuring investment decisions on new-build developments are sustainable over decades (across the lifecycle of a home, from construction through to operation and management).

Unlike private developers and landlords, who have more flexible revenue streams, both the sales value and rent prices of affordable homes are highly regulated. Although an affordable home occupier benefits from reduced energy bills, the housing association that invests additional capital in low-carbon technology may struggle to recover the increased build cost. For instance, Peabody's average national rent is £95 per week, while Platform's is £108 (64% of the market average for the areas they operate in). So even with grant funding, it can be difficult to offset the additional cost of low-carbon technology.

The barriers for housing associations are complex and specific to organisations' individual circumstances. For instance, local authorities in some areas provide flexibility on affordable rents, while those in other areas do not. And in some places, housing associations can find it challenging to find developers willing to install heat pumps without incurring substantial price increases.

To some extent, introducing minimum standards for low-carbon technology in new-build homes will help level the playing field, particularly in negotiations with developers where heat pump installation will be non-negotiable. However, it will not remove all the financial challenges outlined above. And, as discussed in the previous chapter, bill savings increase with greater amounts of solar and a battery. Without the right incentives, it will be very difficult for housing associations to go beyond minimum standards to include or increase the amount of solar in new-build developments.

While the financial case for cleantech homes in the affordable housing sector is still evolving, the social value associated with these homes is clear. They are healthier and more affordable for tenants and customers – and are likely to reduce turnover, voids, and arrears for landlords. This improved customer experience can be linked to improved financial outcomes for landlords. As such, the social housing sector could collaborate to demonstrate the positive community outcomes from delivering more sustainable homes to help improve business cases for sustainable build.

Ultimately, regulations will need to better support housing associations so they can invest in cleantech homes on a greater scale. If the UK is to make a 'just transition' to net-zero, social tenants and people buying affordable homes should be equally able to reap the financial and health benefits that come from cleantech homes.

4.3 How SMI Lighthouse Project members are helping maximise the commercial case

Peabody is committed to phasing out gas and ensuring its homes are net-zero-ready.

Platform will accelerate delivery of cleantech homes beyond the FHS indicated target, achieving 100% by 2028. It will also co-create an education programme in partnership with customers to ensure knowledge and support are provided to realise the benefits of living in cleantech homes. Additionally, it will spearhead collaboration across the housing sector to encourage insight and data sharing on delivering cleantech homes. In partnership with other landlords, it will capture evidence to demonstrate the impact on comfort, affordability, and sustainability.

Pobl, having built in excess of 500 electric-only homes to date, will continue to build grant-funded, electric-only affordable homes at pace – in line with the Welsh Government's Development Quality Requirements 2021.[45] It will deliver 475 grant-funded, electric-only homes per year over the next five years, equating to 2,375 homes in total.

45 Welsh Government (2021) Welsh Development Quality Requirements 2021: Creating beautiful homes and places.

RICS is developing additional sustainability-related guidance for UK residential valuation practitioners. Property value is a key determinant of lending decisions, and this guidance will support existing requirements set out in the RICS Valuation Standards – Global.[46]

Lloyds Banking Group works with over 200 housing associations across the UK, from small local associations of several hundred homes to larger regional associations with tens of thousands of homes. In 2023, it supported £2.7 billion of new funding to the sector, of which £1.4 billion is sustainable or sustainability-linked. Lloyds Banking Group also launched a strategic partnership with Crisis and is calling for one million new social homes to be built in the next 10 years.[47]

Lloyds Banking Group, as a private landlord through Citra, is committed to reducing reliance on fossil fuels to heat and power its homes. For 2024, it is looking to start a 'test and learn' pilot to adapt 20 new homes to 'Zero Bills' specification and to contract on their first homes built to FHS.

> *"New homes are undergoing a rapid transformation to being healthier, smarter, cheaper to run and far better for the planet. The Future Homes Hub is working with the breadth of homebuilders, energy companies, infrastructure providers, manufacturers and the Government to implement the findings of this report and support this transition."*
>
> **Ed Lockhart, CEO, The Future Homes Hub**

4.4 Recommended actions for improving the commercial case for cleantech home developments

Update regulations to empower housing associations. To help overcome the barriers facing housing associations, there urgently needs to be a deeper conversation between housing associations, Homes England, local authorities, and central government. This could look at how housing associations can continue to build new affordable homes at volume and scale – while incorporating low-carbon technology that improves affordability and environmental outcomes. Important areas for input would be the long-term total costs, benefits, and value of cleantech homes to housing associations, tenants, and buyers – while potentially accounting for the future cost of retrofit.

46 The RICS home survey standard provides consistency, transparency, and competency for condition-based home surveys. The concise mandatory requirements establish 'benchmarks' – including those in relation to 'energy matters' – which clearly set out the different survey levels and what is included in each one. The complementary RICS home survey consumer guide provides user-friendly supporting information for prospective vendors and purchasers, enabling them to make informed decisions about the required level of survey.

47 Lloyds Banking Group (2023) Sustainability report.

5

5. Cleantech homes have huge health benefits: *They improve air quality for occupants*

Key takeaways

- Gas boilers are significant sources of harmful indoor air pollution and produce condensation that causes mould. Replacing them with electric heating will help reduce the severity and incidence of asthma and other illnesses.
- The World Health Organisation has affirmed that access to affordable, clean household energy is key to reducing air pollution and improving public health.

5.1 6.7 million premature deaths every year are linked to air pollution – and cleantech homes can help reduce this

Gas boilers and cookers produce substantial nitrous oxide (NOx) emissions, for instance, accounting for approximately a fifth of total NOx emissions across Greater London.[48] NOx makes a substantial contribution to the severity and incidence of asthma and other respiratory illnesses in the UK. By contrast, electric heating does not produce NOx at all.

Gas boilers and cookers also produce condensation, which can lead to mould in homes that are not properly ventilated. Because electric heating systems reduce these condensation levels, they further contribute to a healthier home for occupants.

The WHO affirms that access to affordable, clean household energy solutions for cooking, heating, and lighting is key to reducing harmful air pollution and improving public health.[49] It estimates that the combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually. Poor energy efficiency, inadequate ventilation, and fuel poverty also have negative impacts on mental health.[50]

48 ECIU (2020) Analysis of gas boilers and NOx: The hidden emitter.
49 World Health Organisation (2022) Energy, air quality, and health.
50 Curl and Kearns (2017) Housing improvements, fuel payment difficulties, and mental health in deprived communities, International Journal of Housing Policy.

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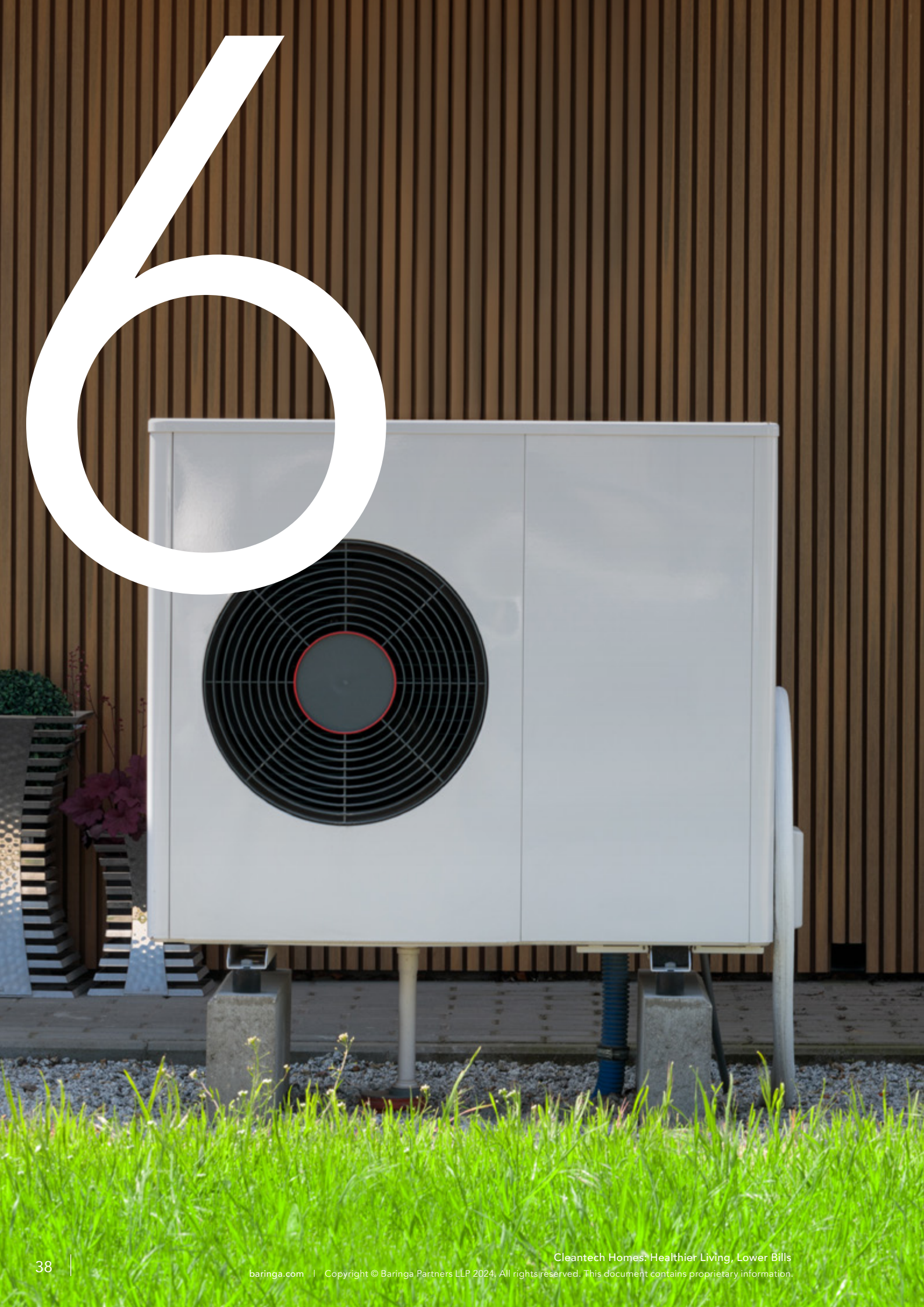


6. Householders are very satisfied with heat pump performance and demand for low-carbon tech is growing

Key takeaways

- Cleantech homes with heat pumps are providing people with greater or equal satisfaction than homes with gas boilers. This dispels another myth that heat pumps don't work in UK homes. Societal awareness of cleantech home benefits is also growing.
- Property listings now include more references to low-carbon technologies, and users of property websites like Rightmove are increasingly searching for them.
- Industry and policymakers need to capitalise on this momentum to turn the tide for good – and cement cleantech homes as the desirable homes of the future. This involves providing more independent information on cleantech homes at crucial points in the customer journey.

6.1 Cleantech homes are comfortable – and there's growing awareness of this

Numerous surveys – including a Baringa-commissioned survey for this report – now show very high consumer satisfaction rates from heat pump users, equal or greater than boiler users. In one recent survey, 91% of respondents reported being satisfied with their heat pump versus 74% of boiler users.[51] In another recent survey, over 80% of people who recently switched to a heat pump stated that they were satisfied or more than satisfied with their new heating system, roughly the same as gas boiler users. Satisfaction metrics included safety, noise level, hot water heating, and reliability.[52]

This also stands in winter, dispelling assertions that heat pumps don't heat homes as well as gas boilers in UK homes, with 90% of both heat pump and boiler users stating their heating systems did a good job of maintaining desired temperature levels.[53] And, during the cold snap in early 2024, homeowners using heat pumps reported being happier with how warm their homes stayed (compared to those with gas boilers).[54]

51 Census-wide survey for Baringa (June 2024). Survey of 2,894 respondents who were Octopus Energy customers with either heat pumps or gas boilers in all home types.

52 Nesta (2023) Heat pumps: A user survey.

53 Ibid.

54 A recent Octopus Energy consumer survey of 2,000 people showed that heat pump users in existing homes were one point out of 10 happier (eight versus seven) on average than gas boiler users in terms of how warm their homes stayed during a cold snap in January 2024.

People also find their heat pumps cheaper to run than gas boilers – 69% of heat pump users stated their heating was cost-effective, versus only 41% for gas boiler users.[55] This makes sense, given the discounted heating tariffs now being offered by some suppliers to heat pump users, which are around 40% cheaper than standard electricity rates. However, in terms of ease of use, the heat pump industry still has room for improvement – 82% of gas boiler users found their heating controls easy to use but only 73% of heat pump users did.[56] Better information availability and handover during installations should help address this imbalance for householders.

These satisfaction scores are a hugely positive sign as the new-build sector continues its transition. Importantly, they refute unfounded claims that heat pumps don't work in UK homes and that people don't like them. We hope that, as heat pump adoption increases, consumer awareness of these benefits grows.

55 Ibid.

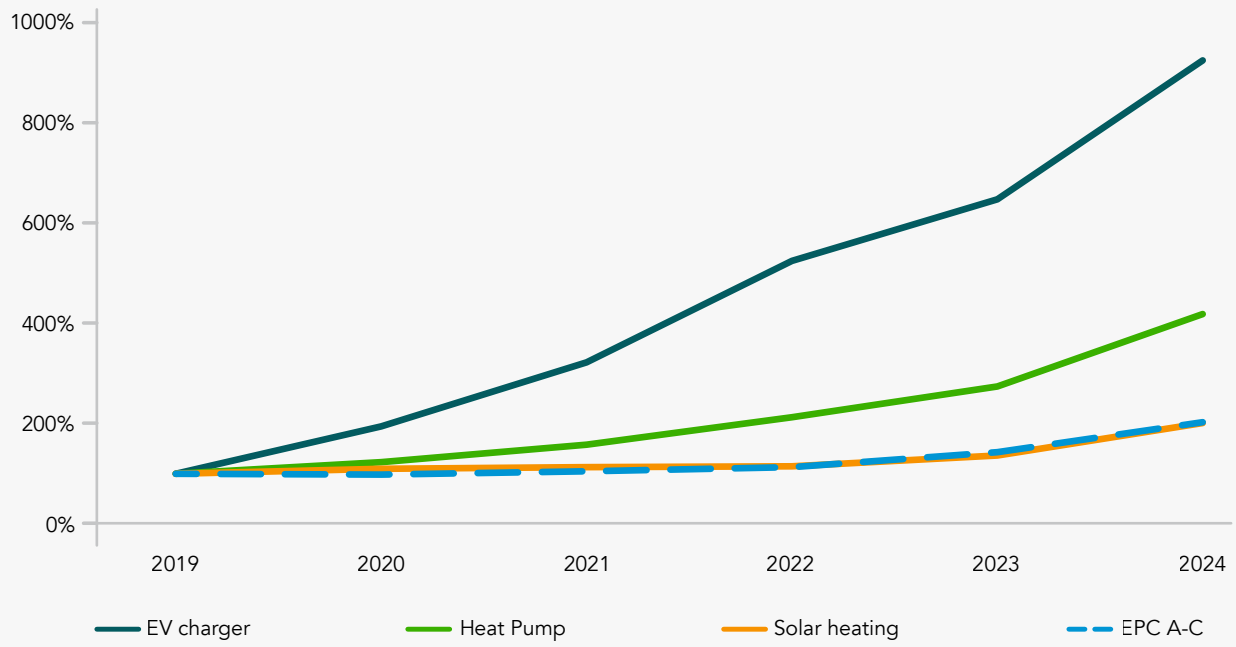
56 Census-wide survey for Baringa (June 2024). Survey of 2,894 respondents who were Octopus Energy customers with either heat pumps or gas boilers in all home types.

6.2 Demand for cleantech homes is increasing

The growing awareness of cleantech home benefits is increasingly reflected in people's approach to buying and renting existing and new-build homes.

'Solar panels' is now in the top 100 most-searched keywords on Rightmove, up from the top 500 in 2020. 'Heat pumps' has also surged from >1,000th place in 2020 to the top 200 in 2024.[57] Estate agents are changing how they list properties in response to this increased consumer awareness, with mentions of low-carbon technologies rising significantly since 2019 (see Figure 7).

Figure 7: Proportion of sales listings mentioning green term, indexed to 2019



RICS has also found a growing focus on energy efficiency in their UK residential market survey of property sellers and estate agents.[58] Respondents were asked if they had seen greater buyer interest in more energy-efficient homes (existing and new-build). Of those that held a view, 39% said they had noticed an increase in such demand (up from 34% when this question was last asked in June 2023). Interestingly, 26% of respondents said buyers were highlighting poor energy efficiency as a reason for making an offer below the asking price (up from 23% previously).[59]

57 Rightmove Data Services (2024).
58 RICS (February 2024) UK residential market survey.
59 Ibid.

6.3 How SMI Lighthouse Project members are helping drive consumer awareness

The Hill Group is pledging to share its journey to cleantech homes with relevant stakeholder groups and industry peers through its ongoing collaborative work with the Future Homes Hub.

Savills is expanding its ESG-related employee learning and development programme to include further training on the features and benefits of sustainable homes.

Rightmove is working to:

- Increase its volume of educational green content by 30%, including information on cleantech home benefits.
- Undertake and publish consumer research on barriers to adoption and what would encourage people to make greener choices.
- Allocate product resources to explore ways of increasing energy performance information on all property listings, as well as other ways of highlighting cleantech homes on its website.
- Encourage estate agents to include more low-carbon terms in property listings, through its education programme.

"We have the responsibility and the opportunity to help the millions of people who use our platform transition to more sustainable living. We have been extensively tracking data trends to identify both the increased interest in greener homes and the barriers to making greener choices. We will continue to increase our efforts to better educate renters and homeowners to help them make more informed choices. We are also upping our efforts to educate homemovers and the industry about the cost, health, and environmental benefits of cleantech homes."

Johan Svanstrom, Chief Executive Officer, Rightmove

6.4 Recommended actions for broadening consumer awareness

Provide more independent information on cleantech homes. There remains a gap in the independent information available about what electric heating systems are, how they benefit bill savings and health, how they work, and how other low-carbon technologies like solar panels can make them cheaper to run. This could be holding people back from choosing these technologies.

We ask industry to make information about low-carbon technologies more accessible and provide more widespread education so people can better understand the benefits of new cleantech homes. The imbalance in terms of perceived ease of use between heat pumps and gas boilers mentioned above needs correcting. Industry needs to focus on improving the user experience.

Make cleantech home information available at crucial points in the customer journey. Estate agents could be at the front line of providing more information about low-carbon technologies, including through real estate listings. This will boost consumer awareness, which could lead to value being acknowledged in house prices and then reflected in valuation standards. However, estate agents are just the start. We ask industry to invest in training, for example alongside Propertymark (a membership body for estate agents), to educate the wider industry and salespeople about the benefits of cleantech homes. This will help people become effective ambassadors to consumers, further raising societal awareness.

7

7. Cleantech homes benefit mortgage providers: *They can increase borrowing power*

Key takeaways

- Lending against cleantech homes benefits mortgage lenders' portfolios by increasing customers financial resilience through lower energy bills, retrofit and value risk, and carbon emissions.
- It is mutually beneficial for lenders to incentivise people to buy cleantech homes, for example, through 'green' mortgages with preferential rates or cashback.
- Lenders need access to clear and consistent data that enables standardised decision-making during mortgage affordability calculations. To date, this has been Energy Performance Certificates (EPCs), which determine a property's energy efficiency. However, EPCs are currently unfit for purpose and need to be reformed so they provide a reliable source of information about cleantech homes.

7.1 Lenders are increasingly incentivising investment in cleantech homes

The financial sector can play a huge role in facilitating the build of cleantech homes, for instance through 'green' mortgages. 'Green' mortgages can include features like preferential rates or cashback to reward borrowers for buying sustainable homes. There are compelling reasons for mortgage lenders to offer these lower interest rates and other incentives:

- **Reduced carbon emissions within mortgage portfolios.** It helps lenders work towards commitments they have made to support the transition to net-zero.
- **Responsible adjustments to affordability calculations.** Lower energy bills free up disposable income for borrowers (all else being equal), meaning home buyers might be able to responsibly borrow more if needed to purchase a cleantech home.
- **More resilient investment.** Cleantech homes are more likely to hold value in the long term because they are already net-zero ready and do not need retrofitting to meet the future emissions standards likely to be introduced as the UK moves closer to its 2050 net-zero target.

Lenders such as Leeds Building Society and Perenna are already offering green products.[60] Perenna is offering preferential rates for greener, new-build homes, including those which qualify for zero energy bills.[61,62] Perenna provides mortgages with higher affordability ratios to people who buy new-build homes to Octopus Energy's 'Zero Bills' standard , while Leeds Building Society is increasing its affordability calculation for new-build homes.

60 Leeds Building Society (2021) We've launched two new mortgages for the most energy-efficient homes.
61 Octopus Energy Zero Bills Homes.
62 Perenna Zero Bills Mortgage.

7.2 How SMI Lighthouse Project members are contributing to increased cleantech home investment

Lloyds Banking Group launched a Housebuilding Sustainability Finance Framework, which sets out how it will help housebuilders access green and sustainable finance to build more sustainable homes. It believes that the framework was one of the first sector-based financing frameworks issued by a financial institution in the UK. During 2023, it supported the delivery of £2.4 billion sustainable or sustainability-linked finance to the housebuilder sector.[63]

Lloyds Banking Group is also committing to further exploring how it can evolve its mortgage affordability assessment to recognise the expected lower energy running costs of owning a more energy-efficient property.

> *"As the UK's leading provider of financial services, we bear significant responsibility in helping to finance the transition to a low-carbon economy. Decarbonising our housing stock is critical to achieving this – while also meeting urgent demand for good-quality homes which are energy-efficient and more affordable to run. We support all parts of the UK housing sector, partnering with hundreds of housing associations, financing developers' sustainability goals, and supporting millions of homeowners and first-time buyers as the UK's biggest mortgage provider. We want to help facilitate more high-quality, greener homes for the benefit of people and planet."*
>
> **Charlie Nunn, Chief Executive Officer, Lloyds Banking Group**

7.3 Recommended actions for facilitating lending on cleantech homes

Accelerate EPC improvements and introduce Smart EPCs. EPCs play a major role in helping both homebuyers and mortgage providers understand a home's energy-efficiency performance and low-carbon technology status. However, the EPC scheme is currently unfit for purpose, and there is a lack of available and accurate data about low-carbon technologies in homes.

We urge **policymakers** to set clear, firm timelines for implementing the new Home Energy Model, which will be used to produce EPCs for all new-build homes. We also call for accelerated improvements to EPCs for existing homes, so they provide an accurate, up-to-date, and robust standard for measuring energy performance. Importantly, the improved EPCs should better value heat pumps and demand

63 Lloyds Banking Group (2023) Sustainability report.

flexibility. We make these recommendations building on the Committee on Climate Change's open letter on EPC reform.[64] These changes will help lenders more accurately value properties, price mortgages, and calculate mortgage affordability.

Spotlight on: Energy Performance Certificates

What is wrong with the current EPC methodology?

EPCs provide a rating (A-G) to homes based on energy efficiency, with A being the top rating. However, as noted in the Government's EPC action plan published in September 2020, there are key issues with the scheme:[65]

- Incomplete data – only 50% of UK homes have a valid EPC rating
- EPCs for new builds are not captured on a central database
- Often they are not updated following upgrades
- Assessment methods are applied inconsistently
- Homes with heat pumps often score more poorly than homes with gas boilers because EPCs do not account for energy intensity, carbon intensity, or the household's ability to use energy flexibly and access smart tariffs
- They provide poor assessments of the cost-effectiveness of energy efficiency upgrades in existing properties

How should EPCs be reformed?

A new calculation should be introduced to calculate 'Smart EPCs' that capture data on five primary metrics:

- Energy use intensity
- Space heating demand intensity
- Heating system type
- Overall energy cost
- The capacity of a home's energy consumption to be flexible (having a smart meter and interoperable appliances)

We note the recent consultation on a proposal for a new Home Energy Model to replace the current EPC scoring methodology in new-build homes. This could be introduced alongside the FHS.[66] We call for timely implementation and for it to be replicated for existing homes (including the five primary metrics).

64 Committee on Climate Change (2023) Open letter on the reform of domestic EPC rating metrics to support delivery of net-zero.

65 Ibid.

66 UK Government (2024) Closed Consultation: Home Energy Model: Future Homes Standard assessment.

8

Cleantech Homes: Healthier Living, Lower Bills

8. Cleantech skills and supply chains are expanding rapidly: *Industry is developing what's needed to install at scale*

Key takeaways

- The new-build sector is the first significant frontier of growth for developing a sustainable heat pump supply chain. It is triggering thousands of professionals to retrain and switch away from the boiler market – and hopefully thousands more to pursue desirable new careers in the low-carbon economy. Thousands of people are now qualified heat pump installers, and this should be enough to service new-build demand.
- The real supply chain challenge is the retrofit and maintenance sector, where one million heat pump retrofits will be needed from the 2030s to fully decarbonise existing housing stock.[67]
- Industry and policymakers must continue to support and fund training for installers and the wider supply chain. This is essential to ensure there is enough capacity to service low-carbon technology installations in both the new-build and retrofit sectors.

8.1 11,000 people qualified as heat pump installers in the last two years

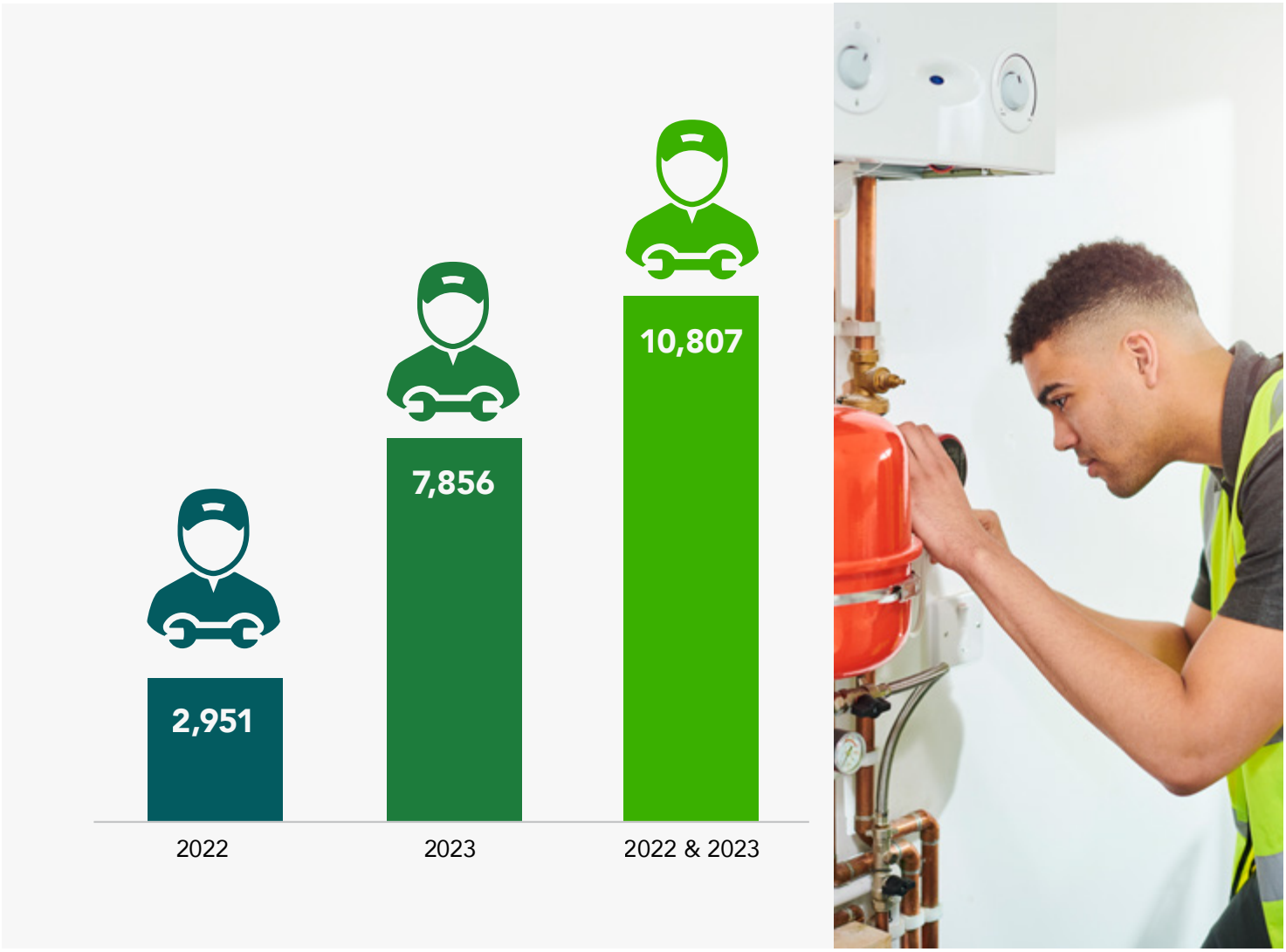
Whereas the solar market in the UK has been scaling and maturing over the last two decades, heat pumps, as the newest low-carbon technology for the UK market, represent the biggest challenge for the supply chain. Industry is preparing well by training thousands of people to install heat pumps. Some 38 heat pump training facilities are now operating across the UK, with a combined capacity to train 40,000 new installers per year.[68] 2023 saw a record jump in formally qualified heat pump installers, with close to 8,000 people qualifying (up from 3,000 in 2022) (see Figure 8).[69] This growth is being supported by schemes such as the Heat Training Grant in England, which gives participants up to £500 towards eligible courses. According to The Hill Group, new-build jobs are attractive to installers because they are simpler than the retrofit market, which requires Gas Safe or MCS accreditation. Bellway will be requiring all heat pump installers to be MCS-certified.

67 Committee on Climate Change (2020) The sixth carbon budget.

68 Heat Pump Association (2024) Combined maximum training capacity from Heat Pump Association member training facilities.

69 The Heat Pump Association began recording data about new qualified heat pump installers in 2022. For comparison, there are approximately 130,000 registered Gas Safe engineers, according to the UK Energy Research Centre.

Figure 8: Number of individuals trained to install heat pumps in the UK



If these trends continue, there should be more than sufficient skilled heat pump installers to meet increasing demand in the new-build sector. We project that if the recent housebuilding rate remains stable, the UK could be installing around 120,000 heat pumps annually in new-build houses alone by 2028 (up from 11,000 in 2023). Assuming two installer days (working days per person to install) per heat pump installation in a new build, this implies a need for approximately 900 full-time installers.[70] The new Labour Government is targeting 300k new homes per year, roughly a 50% increase on recent build rates. If the ratio of houses to flats remains constant this could see 180,000 new houses (and 120k new flats) built with heat pumps by 2029.

70 More than this number will likely be needed overall – to cover installations in dwellings other than houses (such as apartment blocks) and the retrofit market. Additionally, many heat pump installers may still be installing other assets and not working full-time on heat pumps.

8.2 But there is no room for complacency

Reassuringly – and in line with our skills capacity assessment – developers report that they do not currently have problems sourcing qualified installers.

However, the picture is not all rosy. Housing associations have difficulties finding people who can service and maintain heat pumps. There is also a geographical challenge because installers are unlikely to be perfectly matched to regional demand. And because the heat pump qualifications were mostly all awarded in the past 24 months, qualified installers are still likely to be installing and maintaining gas boilers (where demand remains significant at around 1.8 million installations per year).[71]

The retrofit sector will be the main challenge due its far greater volume. By the early 2030s, assuming one million heat pump retrofits per year, we could need 14,200 full-time installers (or 45,000 part-time installers, given that many people will still blend gas and heat pump work).[72]

This means the industry must continue building wider supply chain capacity – or risk roll-out delays. Without a continued increase in gas engineers retraining, there could be a shortage of skilled installers to service the full market including retrofits. Wage inflation is also a risk – increasing demand may mean developers and the retrofit market compete for a small pool of qualified professionals.

Most people who will be installing heat pumps in the retrofit market are still likely to be in school. We need to ensure these jobs are attractive and that there are good apprenticeships and college courses to train the next generation of low-carbon heating engineers. The Low Carbon Heating Technician Apprenticeship is a good step in the right direction.[73]

While the solar market is more mature, there is a parallel need to continue training electricians capable of installing solar panels and battery storage units to meet growing demand. And, as mentioned, it is not just about installers, but also maintenance engineers, heating designers, plumbers, and others in the supply chain.

71 Uswitch (2023) UK boiler statistics.

72 This assumes an average of three installer days across new build and retrofit, and that each installer works full-time on heat pump installations. Average heat pump installer day assumptions (two days for a new build and four days for a retrofit) were sourced from a combination of Baringa research and conversations with SMI Lighthouse Project members while preparing this paper.

73 UK Government Apprenticeship training course: Low carbon heating technician (level 3).

8.3 How SMI Lighthouse Project members are contributing

The Hill Group is pledging to support NHBC training schemes and share learnings with the wider industry.

Lloyds Banking Group is partnering with Regeneration Brainery, a charity that encourages young people to pursue careers in property and regeneration.

Octopus Energy aims to recruit 72 low-carbon technology apprentices in the next year, building on its existing plans to grow its field services business by 3,000-4,000 employees in 2024. It also provides trainee heat pump installers with up to 10 days of training and up to four weeks shadowing in the field.

> *"This work outlines homes that are more comfortable, cheaper to run and healthier to live in. No wonder people prefer them. Low carbon technologies like heat pumps, solar panels, and batteries reduce households' reliance on the grid, while providing back-up support during peak times. We're committed to helping customers make the most of this: smart tariffs unlock unprecedented savings, and can even eliminate bills altogether.*
>
> *Heat pumps in particular are a no-brainer. They're basically magic, turning one unit of electricity into three or four units of heat, and we're deploying them more quickly and cheaply than anyone expected. Octopus is currently training thousands of low carbon engineers across the country to install the tech needed to deliver the energy transition, while innovating to drive prices down for industry and consumers alike."*
>
> **Greg Jackson, CEO of Octopus Energy**

8.4 Recommended actions for continuing successful skills base growth

Drive capacity growth across the lifecycle and supply chain. Policymakers, the education sector, and wider industry should continue measuring and monitoring supply and demand to ensure enough new entrants are being attracted to the sector. This needs to go beyond installers because capacity growth is also needed at the design and build stage – including heating designers, architects, electricians, and plumbers. The same goes for sales and marketing teams, who could be upskilled on the benefits of cleantech homes to help people understand how to operate and get the most out of their new heating systems.

Provide grants to support retraining. Policymakers could provide more generous retraining grants for sole traders and SMEs who cannot afford to take time out of work to retrain.

Develop an industry standard for heat pump installations in new-build homes. Policymakers could work with industry to design a training quality standard for heat pumps and implement it as soon as possible. This will support scale because training providers will be able to grow confidently knowing training courses are valuable and meet industry requirements.

Ensure training delivers required competencies to recognised standards. Many existing training programmes are one-to-two-day, brand-specific courses by manufacturers – and are unlikely to provide the full knowledge needed to install a variety of heat pumps. Industry and education providers could ensure the right quality and consistency in line with standards. In addition to industry efforts to address this, the NHBC is considering whether there is a case for opening training centres for new-build housing.

9

9. Cleantech homes support power grid expansion: *There are positive implications for grid connections*

Key takeaways

- Cleantech homes can play a vital role in supporting the power grid as it prepares for the mass electrification needed to achieve a net-zero economy. Networks currently have ample spare capacity overall, but to prepare for increased demand and manage localised congestion, distribution network operators (DNOs) are increasingly taking advantage of smart and flexible technology to maximise network use.
- The cleantech home transition provides opportunities for consumers, suppliers, and grid operators to reduce peak loads and the need for grid reinforcement – resulting in lower energy bills for all.
- Key actions are required from policymakers and industry to enable this, such as introducing half-hourly settlement in a timely manner, improving planning processes, ensuring low-carbon technologies are smart-enabled and have consistent connectivity standards, and offering smart tariffs that enable flexible energy use.

9.1 Cleantech homes are reducing the need for grid reinforcement – which reduces energy bills for everyone

Residential electricity demand is forecast to roughly double in some scenarios between now and 2050 as we move away from gas boilers and petrol engines to meet the UK's net-zero target.[74] This is a departure from the past 10 years, where electricity demand has consistently fallen largely due to energy efficiency improvements on a total and per capita basis.

Electrifying transport and heating will increase electricity demand. However, electric technologies have inherent flexibility because they can be switched off and on at will. And when combined with thermal storage (hot water tanks) and batteries, they can actually support the grid by using electricity outside of peak hours without compromising consumer comfort – thereby reducing strain on the network.

As a result, the cleantech home transition provides opportunities for consumers, suppliers, and grid operators to reduce peak loads and the need for grid reinforcement – resulting in lower energy bills for all.

74 National Grid (2023) Future energy scenarios.

9.2 Smart and flexible grid use means we can accelerate connections and savings

Overall there is substantial capacity on the distribution network to connect new projects. For instance, UK Power Networks has 40% headroom in its network on average, including in London. But some projects do see grid connection delays or need to pay for costly reinforcements because of localised congestion.[75] For example, Bellway has been given connection dates as far away as 2028 for new developments in West London.

DNOs are increasingly taking advantage of smart and flexible technology to maximise network use. There are two elements to this:

- Working closely with the developer to understand precisely what the new development's demand is – and refining assumptions about heat pump load.
- Installing flexible assets to help manage demand peaks that would exacerbate grid constraints – e.g., developers installing on-site batteries to help manage peak demand, or DNOs launching local demand-side response schemes.

These efforts have allowed some developers to reduce connection sizes for new developments by up to 15% (see Figure 9). And depending on the type of technology installed, there can be additional revenue streams available to homeowners and developers, such as from selling excess energy from solar panels and batteries back into the grid.

A good example of this is a collaboration between UK Power Networks, Scottish and Southern Electricity Networks, and the Greater London Authority to increase West London capacity by procuring demand flexibility services. Time-of-use tariffs reduce demand in peak hours while help people saving money on bills at other times of the day. They are now being rolled out to areas of West London with capacity challenges.

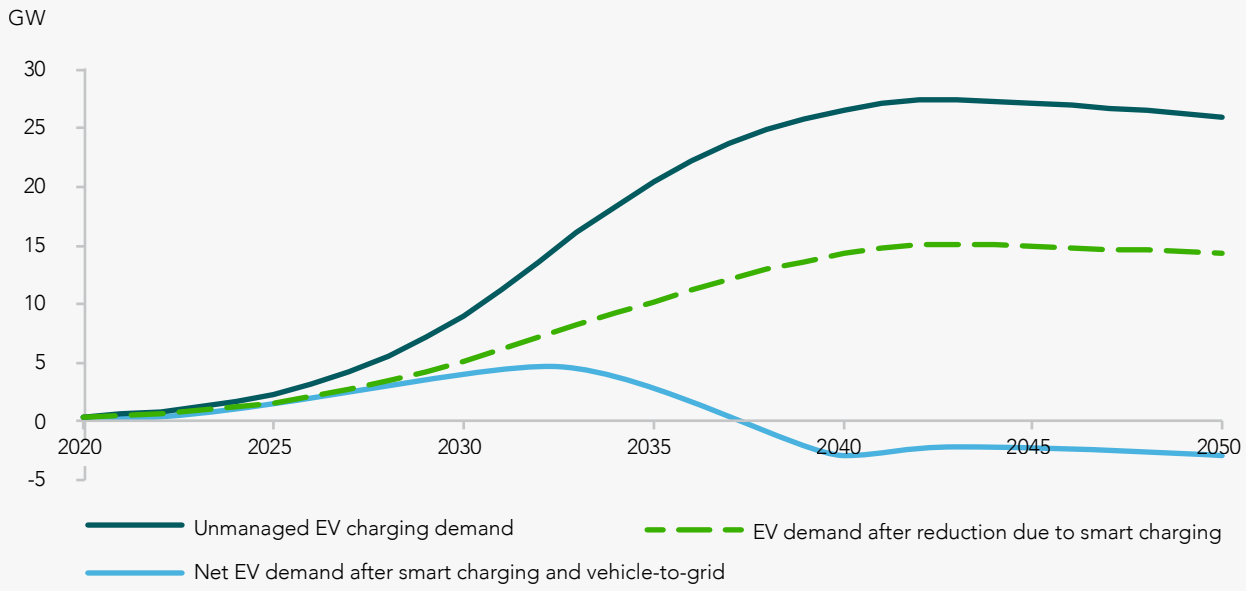
Smart electricity usage will reduce total energy costs

As the number of cleantech homes scales across the country – and a wider set of consumers uses low-carbon technology – flexible demand will help reduce the UK's total energy costs. It will also reduce the need for new generation projects and grid reinforcements.

The introduction of the Market-wide Half-Hourly Settlement (MHHS) reform planned for 2026 will be a key enabler of residential flexibility. It will provide consumers with an estimated benefit of £1.6-4.5 billion to 2045.[76] The potential for peak avoidance is huge; in some scenarios, National Grid projects that peak EV charging demand can be fully offset through flexibility services, and even contribute to power supply during peak periods (See Figure 9).

75 UK Power Networks proprietary analysis.
76 Ofgem (2024) Electricity settlement reform.

Figure 9: Electric vehicle charging behaviour during peak demand in National Grid's Consumer Transformation scenario



Three benefits of smart electricity usage

- **Lower bills.** Demand can be shifted to off-peak periods when electricity costs are lowest (as both thermal energy in hot water and electrical energy can be stored in people's homes, unlike mains gas)
- **Lower carbon emissions.** High price periods are correlated to high carbon periods because gas generation is needed to supplement low-carbon power
- **Lower network costs and quicker connections.** If people use less power during peak periods, DNOs can spend less on network reinforcement and everyone can enjoy lower network costs

Figure 10: Smart energy and flexibility case studies

	Project summary New development of 1.5k homes plus non-domestic units, fitted with electric heat pumps
Location and DNO	Chelmsford, UKPN
Developer	Ptarmigan Land
SNRG Funded Solution	5.25MW solar array, 6MWh battery, EV chargers, eMobility Hub
Resident Benefit	15 – 30% energy cost savings for 30 years
Grid Connection Saving	£3m
How was the saving achieved?	Reduced peak demand of the development by using a centralised solar and storage system which permitted a lower voltage connection

	Project summary 300 new homes, plus a wastewater pumping station
Location and DNO	Kent, UKPN
Developer	Confidential
SNRG Funded Solution	923 kWp rooftop solar, 1.5 MWh battery, EV chargers, load export and control system
Resident Benefit	c.30% energy cost savings for 30 years
Grid Connection Saving	£1.3m
How was the saving achieved?	15% reduction in peak demand due to smart load and control system, avoiding need for grid reinforcement

9.3 How SMI Lighthouse Project members are improving connectivity and flexibility

UK Power Networks is working closely with SMI Lighthouse Project members and other organisations to prepare the network for the roll-out of cleantech homes. It is taking a data-led approach that enables more efficient and timely connections. UK Power Networks will:

- Reduce its demand assumption for electric-heated homes by 25% based on using improved data and analytics on how its network is being utilised.
- Continue to optimise its models using demand profiles based on actual observed data rather than generic planning assumptions.
- Help build the case to extend the 5 kW 'connect and notify' standard to new-build houses, to enable more efficient and timely connection of residential rooftop solar arrays.
- Engage with housebuilders at masterplanning to inform network development, so capacity is available in a timely and coordinated manner.
- Help simplify the customer journey in collaboration with other SMI Lighthouse Project members, enabling quicker and more efficient connections.

Octopus Energy is committed to working with low-carbon technology manufacturers to ensure products are smart-enabled and can work with smart tariffs. It is also committing to continued engagement and data sharing with network operators to reduce connection costs and enable smart control of low-carbon technologies.

> *"Facilitating the transition to net-zero is a key pillar of UK Power Networks' business vision. We are already collaborating with housebuilders, energy suppliers, and SMI Lighthouse Project members to ensure that electricity network capacity is available to enable timely and cost-effective connections, that customer journeys are simplified, and that our flexibility-first approach keeps bills as low as possible for people."*
>
> **Basil Scarsella, Chief Executive Officer, UK Power Networks**

9.4 Recommended actions for improving grid connectivity and resilience

Improve planning processes. We call on DNOs, energy suppliers, and housebuilders to work together to improve planning processes for connecting new homes to the grid through more collaboration at the masterplanning stage.

Ensure low-carbon technologies have consistent connectivity standards. Policymakers and equipment manufacturers should collaborate to ensure interoperability of low-carbon technologies and consistent connectivity standards. This will ensure all residents can access the same flexibility benefits.

Promote and enable flexible energy use. We call on industry to introduce new smart tariffs, fully roll out smart meters, which are needed to enable demand flexibility and encourage the use of smart-enabled appliances.

10

10. New-build cleantech: *A catalyst for retrofit*

The continuing success of cleantech in the new-build sector will pave the way for a faster, smoother transition in the retrofit market, which is experiencing substantial challenges.

We need to decarbonise the energy consumption of all 28 million UK households, but at the current rate, it would take 43 years to upgrade all houses to EPC C (let alone retrofitting boilers).[77] Plus, it is expensive. As part of its sixth Carbon Budget, the Committee on Climate Change estimated it would cost £250 billion to fully decarbonise the UK's existing housing stock.[78] There are huge financial challenges for private homeowners because the average retrofit cost can be £12,000 without grant funding.[79] And then there is the estimated skills shortage of 350,000 new roles needed to meet the overall net-zero aims in the energy-efficiency retrofit sector.[80]

These challenges can be addressed – and there are clear ways the new-build sector's cleantech transition can act as a catalyst for retrofit.

77 Rightmove (2023) Greener homes report.

78 Committee on Climate Change (2020) The Sixth Carbon Budget.

79 Eunomia (2024) Cost of domestic and commercial heating appliances: A report for the Department for Energy Security and Net Zero (Figure 3.1).

80 Baringa (2024) The great British retrofit.

10.1 How the new-build sector can speed up the retrofit transition

Greater consumer awareness and knowledge. The growth of new-build cleantech homes will increase consumer understanding and drive demand for low-carbon technologies in retrofitting. This will allow homeowners and tenants to take a more informed approach to retrofitting. It will also provide more evidence to support higher valuations for cleantech homes, which will drive greater investment and create a virtuous cycle.

Technology cost reductions. More heat pump and solar panel installations will improve retrofit economics. Through initiatives like the FHS in England and New Build in Scotland, scale from the new-build sector will help drive down technology costs and speed up paybacks for consumers.

More funding and policy support for social landlords. To incentivise energy efficiency improvements and low-carbon technology installations in existing social rental homes, policymakers should abolish VAT on all home improvements and associated costs for the not-for-profit sector.

Improved data quality and availability. The rise in cleantech homes will provide clear, ongoing evidence of green premiums – which will incentivise energy-efficiency retrofits. Learnings from the new-build sector will inform and facilitate a smoother transition towards heat pumps, solar panels, and batteries in the retrofit sector.

More mature and efficient supply chain. Supply chain and installer market development will reduce costs, increase capacity, and enhance expertise in the retrofit market.

11

11. A positive start, but we cannot afford delays

To meet net-zero targets in the most efficient way while delivering benefits to all, industry and policymakers cannot delay. The new-build sector has everything it needs to accelerate the transition to cleantech homes now. Failure to do so will have significant negative implications for the UK's target and consumer bills.

We must avoid £4 billion in extra costs and 1.7 Mt of additional carbon emissions

Every home built now with a gas boiler will need to be retrofitted down the line. Simply meeting the FHS estimated cleantech home build rate instead of scaling up could unnecessarily cost future homeowners around £4 billion (versus continuing to build homes without gas boilers at the recent rate of growth).[81] It could also generate an additional 1.7 Mt of carbon dioxide – equivalent to adding around 100,000 new petrol or diesel cars to the road each year.[82] This will move the UK further from its net-zero targets.

New-build must deliver efficiencies and build rates that drive retrofit

The new-build sector can act as a catalyst for addressing the significant decarbonisation barriers in the retrofit market, where around 31 million people live in poorly insulated homes that cost more to heat and contribute to negative health outcomes.

Building cleantech homes more quickly and providing more informative content to consumers will drive up demand for heat pumps, the technology highly likely to be stipulated by the Government's new standards for cleantech homes, as well as other low-carbon technologies. This will create the supply chain efficiencies and learning rates required to support the growth the retrofit market requires.

Cleantech homes bring a healthier, more sustainable world within reach

They are better for the planet, improving air quality and cutting emissions. They are better for people, reducing bills, enhancing health outcomes for future generations, and reducing the burden on the NHS. And they are better for the economy, increasing work productivity and boosting job creation.

We will look back at the era of gas boilers in the same way we look at other societal changes people were initially nervous about, like banning smoking indoors in public spaces and mandating seat belts in cars. **Let's not delay leaving that era behind – and creating a brighter cleantech future for all.**

81 This represents the potential future retrofit cost of building homes with gas boilers in line with the FHS estimated trajectory, which reaches 100% of all new homes by 2029. By removing gas from new homes earlier – in line with the annual growth rate since 2020 – around £4 billion could be saved from 2024-2028. This assumes an average retrofit cost of £12,000.

82 Net carbon emissions delta between Baringa's low and base case projection over a 12-year period from 2024.

12

12. Appendix

12.1 Pledges and existing initiatives from SMI Lighthouse Project members

Bellway Homes

- Has committed to significant reductions (55%) in the carbon emissions associated with the homes it builds by 2030. This is written into its long-term commitment to acting sustainably and responsibly, its Better with Bellway business strategy. This carbon reduction target goes beyond the requirements of the FHS and aligns with the Paris Agreement, the international treaty on climate change. Its targets have also been validated by the Science Based Target initiative (SBTi).
- Prioritises a fabric-first approach to the design of new homes.
- Is committed to moving away from fossil fuels and will use electrical space and water heating to achieve its 2030 carbon target. It has committed to undertaking an electric-only initiative, and each operational division will have live sites with air-source heat pumps in build during 2024-2025. This initiative will provide early insight into air-source heat pump design principles, encourage workforce upskilling, and stimulate the supply chain.
- The design of Bellway's new homes featuring air-source heat pumps will include a combination of very high levels of thermal insulation and mechanical ventilation.
- Supports the use of energy-saving solutions such as wastewater heat recovery and solar PV electricity generation. These will result in low running costs for its customers, as well as low-carbon house type designs that do not require retrospective improvements in the future.

The Future Homes Hub

- Works with DNOs, INOs, and other stakeholders to enable more efficient and lower-cost connections.
- Works with homebuilders, policymakers, and other stakeholders to understand the demand for and supply of products and skills – and to pursue the actions required to fill gaps.
- Works with homebuilders and other partners to raise consumer awareness of the benefits of cleantech homes and what consumers need to operate them effectively.
- Works with industry and policymakers to develop a skills plan for implementing cleantech homes across the sector.
- Works with lenders, surveyors, valuers, and homebuilders to provide evidence of how consumers value cleantech homes.

The Hill Group

- Has been a first mover in transitioning to cleantech homes, switching all pending planning applications away from gas as early as 2020. It will cease all sales of gas-heated homes in 2024 (excluding where homes are connected to community gas-fired district heating schemes).
- Shares its journey to cleantech homes with relevant stakeholder groups and industry peers through writing good practice guides, sharing case studies, and assisting smaller SME companies.
- Supports the development of training centres alongside the NHBC and MCS to foster a workforce to install and commission heat pumps.

Lloyds Banking Group

- As a mortgage provider, is committed to further exploring how it can evolve its mortgage affordability assessment to recognise the expected lower energy running costs of owning a more energy-efficient property.
- As a private landlord through Citra, is committed to reducing reliance on fossil fuels to heat and power its homes. For 2024, it is looking to start a 'test and learn' pilot to adapt 20 new homes to 'Zero Bills' specification and to contract on its first homes built to FHS.

Octopus Energy

- Aims to recruit 72 low-carbon technology apprentices in the next year, building on its existing plans to grow its field services business by 3,000-4,000 employees in 2024.
- Is committed to working with low-carbon technology manufacturers to ensure products are smart-enabled and can work with smart tariffs. It is also reaching out to industry to develop a common set of standards for the interoperability of devices.
- Is committed to continued engagement and data sharing with network operators – to limit connection costs and enable the smart control of low-carbon technologies.
- Is helping to increase the affordability of cleantech by providing a 10-year guarantee for 'Zero Bills' homes.

Peabody

- Is committed to phasing-out gas and ensuring its homes are net-zero-ready.
- Will build well-designed new homes to at least EPC B standards, incorporating low-carbon heating technology to ensure they are future-ready.
- Through its new homes sustainability framework, will pinpoint resource and investment priorities, with residents actively involved at every stage to enhance their homes' environmental friendliness.

Platform

- Will accelerate the delivery of cleantech homes beyond the FHS indicated target, achieving 100% by 2028. Its 'Platform Standard' specification will ensure homes are high-quality, affordable, and sustainable. All homes in its programme will be built to a minimum of EPC B with gas-free space and water heating.
- Will co-create an education programme in partnership with customers to ensure knowledge and support are provided to realise the benefits of living in an cleantech home. This will incorporate business-wide training – from operational housing teams through to sales representatives – to ensure customers receive robust and consistent support when adopting cleantech technologies.
- Will spearhead collaboration across the housing sector to encourage insight and data sharing on the delivery of cleantech homes. In partnership with other landlords, it will capture evidence to demonstrate the impact on comfort, affordability, and sustainability.

Pobl

- Having built in excess of 500 electric-only homes to date, will continue to build grant-funded, electric-only affordable homes at pace in line with the Welsh Government's Development Quality Requirements 2021 (Creating Beautiful Homes and Places).[83] It will deliver 475 grant-funded, electric-only homes per year over the next five years, equating to 2,375 homes in total.
- Is committed to delivering real, tangible value for people and communities via its ongoing investment in building and maintaining low-carbon homes. Its ongoing development and build programme provides many opportunities for meaningful activity (planned and reactive), including community benefit schemes and targeted recruitment and training initiatives in conjunction with partner organisations. These initiatives are tailored specifically to people in the communities who wish to pursue careers in the green skills sector.
- Is committed to growing its spend with SMEs. SMEs account for an estimated 99.3% of all enterprises in Wales, and in excess of 80% of Pobl's total spend is with local Welsh SME suppliers. Where it is implementing new technologies in homes, both in new build and retrofit, it is working with its local supply chain to provide pipelines of work that allow contractors to prepare and transition for future demand. It is also seeking to provide empty homes as agile learning environments that serve as 'live' sites, enabling the supply chain to adapt quickly to new technologies.

83 Welsh Government (2021) Welsh Development Quality Requirements 2021: Creating beautiful homes and places.

Rightmove

- Will produce and publish an annual Greener Homes report urging policymakers to consider changes that could help the greener homes transition.
- Will increase its volume of educational green content by 30%, including information on cleantech home benefits.
- Will undertake ongoing consumer research to understand current barriers and what would encourage people to make greener choices – and make the research available to industry.
- Will allocate product resources to explore further increasing energy performance information on property listings and to identify new ways to highlight cleantech homes.
- Will encourage estate agents to include more green terms in property listings through its partner education programme.

The Royal Institution of Chartered Surveyors

- Will encourage a clear debate on sustainability as a key consideration in the RICS Global Red Book update consultation (expected to launch in 2024). This will include, subject to consultation feedback, updated guidance on expectations in respect of considering the market impact of sustainability – such as low-carbon technology in valuation reports – where appropriate.
- Will support members to lead and influence clients on sustainability, including low-carbon technology, in line with the new RICS Future Foundations strategy. Its focus will be to help decarbonise the built environment, build climate resilience, promote and protect biodiversity, and embed circular economy principles.
- Will implement the first RICS Residential Retrofit Professional Standard for chartered surveyors in October 2024.
- Will implement the second edition of the Whole-Life Carbon Assessment for the Built Environment Standard in July 2024.
- Will establish a new cross-sector group to shape the surveying services of the future, aligned with the changing sustainability requirements of clients and stakeholders.
- Will deliver the first RICS Sustainability Conference in December 2024.

Savills

- Has a long-term target to achieve net-zero greenhouse gas emissions for its operations (Scope 1 and 2) by 2030 and for its value chain (Scope 3) by 2040.
- Has set 1.5°C-aligned science-based interim decarbonisation targets, is officially part of the SBTi's Business Ambition for 1.5°C, and is a supporter of the Race to Zero Campaign.
- Is committed to demonstrating and facilitating the wider move towards decarbonising through advisory work with clients. It will continue to support the real estate sector on sustainability and energy improvements, helping clients improve the resilience of their portfolios and generally seeking to influence stakeholders towards carbon neutrality.
- Will continue to contribute evidence to support the value of sustainable homes relative to other housing stock.
- Will continue to expand its ESG-related employee learning and development programme to include further training on the features and benefits of sustainable homes and buildings.

UK Power Networks

- Will reduce its demand assumption for a cleantech-heated home by 25% using improved data and analytics on how its network is being utilised.
- Will continue to optimise its models using demand profiles based on actual observed data rather than generic planning assumptions.
- Will help build the case to extend the 5 kW 'connect and notify' standard to new-build houses.
- Will engage with housebuilders at masterplanning to inform network development, so capacity is available in a timely and coordinated manner.
- Will help simplify the customer journey in collaboration with SMI Lighthouse Project members, enabling quicker and more efficient connections.

12.2 Energy cost modelling methodology

- The purpose of this analysis was to assess the potential differences in costs between similar houses given different configurations of energy equipment.
- Modelling and analysis were based on three-bed semi-detached homes, as semi-detached housing is the most common accommodation type in occupied dwellings in England and Wales.
- Multiple archetypes of three-bed semi-detached homes were created for energy cost modelling:
  - **A.** Existing home with gas heating only
  - **B.** New-build home built to 2021 Part L building standards with gas heating only
  - **C.** New-build home built to 2021 Part L building standards with an air-source heat pump
  - **D.** New-build home built to 2021 Part L building standards with an air-source heat pump and solar panels
  - **E.** New-build home built to Octopus Energy 'Zero Bills' home standard with an air-source heat pump, solar panels, and battery storage unit
- For the purpose of this analysis, the main difference between these archetypes is the house's energy demand, which is determined by the energy efficiency standard. These are listed in Table 1.[84]

84 ONS (30 March 2023) Housing in England and Wales: 2021 compared with 2011.

- Archetypes B, C, and D are all assumed to have the same energy demand based on current minimum building regulations in England (2021 Part L). Archetypes C and D include a heat pump and a heat pump plus solar panels, respectively, instead of a gas boiler. This indicates the potential cost difference for new-build homes of the same building fabric standard but with different energy equipment. These archetypes are proxies for the proposed Future Homes Standard: Archetype C is a proxy for Option 2 and Archetype D is a proxy for Option 1 (as currently under consultation).
- Gas boiler efficiency of 90% is assumed. Heat pump efficiency of 300% for heating and 270% for hot water is assumed.
- Where the archetype is described as having a heat pump and a smart tariff, we have reduced the prevailing electricity unit rate in a given year by 40% based on the discount rate in currently available smart heating tariffs, like those provided by OVO Energy, Octopus Energy, and EDF Energy.
- The Octopus Energy 'Zero Bills' home (Archetype E) is assumed to have £0 per year energy cost, given the guarantee that forms part of the customer proposition. The asset configuration required in a three-bed semi-detached home for the proposition to be valid is listed in Table 1.
- To calculate the running costs in Figure 3 of the report, the energy demand and generation assumptions in Table 1 are multiplied by retail electricity and gas price projections. Two sets of projections were used in this analysis – Baringa's and the Government's projection published by the Department for Energy Security and Net Zero (DESNZ). The primary projection used is Baringa's Reference Case retail price projection, which includes bottom-up modelling of different elements of the retail power and gas prices. Starting with the published Ofgem price cap prices for retail electricity and gas valid from April 2024, the prices are then blended over time into the long-term Baringa projection. To provide a range and to reflect long-term energy price uncertainty, the latest DESNZ price projection is also used. The DESNZ projection has higher long-term commodity prices than Baringa's, which results in more savings for cleantech homes versus gas-heated homes. DESNZ does not publish details on the underlying assumptions of its projections.
- Electricity and gas standing charges have been included where appropriate at the Ofgem price cap rate valid from April 2024.
- The results in Figure 3 represent an average total cost to each house of electricity and gas (where relevant) between 2024 and 2027 (inclusive, so four years in total).
- All figures presented are inclusive of Consumer Price Inflation (CPI), which is set at the Bank of England's long-term target of 2% per annum.

Table 1: Energy cost modelling assumptions and outputs

Household archetype: 3-bed semi-detached house		Gross annual energy consumption (kWh)		Projected average annual energy bill 2024-2027 (£)	
		Electricity	Gas	Baringa reference case[85]	DESNZ base case[86]
A: Existing EPC D-rated home with a gas boiler		2,700[87]	11,500[88]	1,750	2,408
B: New-build with a gas boiler		2,700[89]	6,015[90]	1,396	1,836
C: New-build with a 5-kW air-source heat pump	Without smart tariff	5,068[91] (1,938 is for heating and hot water)	Not applicable	1,414	1,809
	With smart tariff	5,068[92] (1,938 is for heating and hot water)	Not applicable	1,231	1,565
D: New-build with a 5-kW air-source heat pump on a smart tariff and a 2.7-kWp solar system		5,068[93] (1,938 is for heating and hot water) Less 2,300 kWh/year solar generation	Not applicable	859	1,125
E: New-build with a 5-kW air-source heat pump, 8-kWp solar system, and 9.5-kWh battery		Not required for calculation as energy bills assumed to be £0	Not applicable	£0	£0

85 Baringa's Q3 2023 reference case price projection.

86 DESNZ Green Book supplementary guidance: Valuation of energy use and greenhouse gas emissions for appraisal (Tables 4-8).

87 Based on Ofgem's average gas and electricity usage.

88 Ibid.

89 Ibid.

90 Based on SAP 10 worksheet for new build (as designed) (Version 10.2, February 2022). SAP modelled figures for gas and electricity usage have been increased by 45%, which is the observed 'performance gap' between modelled output and actual energy demand (Octopus Energy assumption).

91 Ibid.

92 Ibid.

93 Ibid.

Total cost of ownership modelling

- To calculate the 25-year total cost of ownership projections in Figure 4 of the report, four component costs are considered for each archetype:

  A. Upfront cost of the energy equipment

  B. One replacement cost per piece of energy equipment in 2036, where necessary

  C. Total energy cost of each housing archetype

  D. Retrofit cost for houses with gas heating

- The assumptions used to represent cost 11a and 11b are listed in Table 2.
- To calculate 11c, the methodology used in the energy cost modelling is extended for 25 years. Figures are inclusive of CPI and are discounted at 2% per annum. They can be described as nominal, discounted at 2% per annum. In footnote 38 of the paper, the results are shown if the discount rate is increased to HM Treasury's Green Book annual discount rate of 3.5%, which is used to discount future benefits and costs associated with Government investment programmes.
- Retrofit costs are estimated at £10,000-£12,000 based on a recent Eunomia report for DESNZ.[94]
- Maintenance costs have been omitted from the analysis because annual maintenance costs for boilers and air-source heat pumps are assumed to be the same – and therefore net off.
- Modelling was based on a 25-year period to mirror the average repayment term of a mortgage in the UK.

94 Eunomia (2024) Cost of domestic and commercial heating appliances: a report for the Department for Energy Security and Net Zero (Figure 3.1).

Table 2: Energy equipment cost assumptions

Cost item	Upfront cost in 2024 (fully installed cost)	Replacement cost in 2036 (fully installed cost)	Source	Notes
Gas combi boiler in existing home	£2,500	£2,500	Baringa	Observed market prices
Gas combi boiler in new-build home	£938	£2,500	Baringa	Observed market prices
5-kW air-source heat pump, cylinder, larger radiators, and external works	£5,813	£2,500	Baringa	Assumed reduction in heat pump costs Labour and margin materially less for asset replacement
2.7-kWp solar array	£2,784	£400 Inverter replacement only	Baringa	Observed market prices Solar arrays have an economic lifetime of 25 years
'Zero Bills' home configuration (5-kW air-source heat pump, 8-kWp solar system, and 9.5-kWh battery)	£13,500	£6,050	Octopus Energy	Assumed cost to replace heat pump, battery, and hybrid inverter

Sustainable Markets Initiative

Cleantech Homes: Lower Bills, Healthier Living

Putting new-build cleantech homes at the vanguard of domestic decarbonisation

Baringa

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