



30
YEARS
to make UK homes
fit for the future



We must
upgrade
29
MILLION
HOMES



All UK homes
decarbonised
by
2050

NET ZERO BY DESIGN

Our vision of a Zero Carbon Home and how we get there

Upgrade today's homes with the efficiency and tools to retrofit to Net Zero

Urgent action is needed to address energy efficiency in UK homes as our first step towards Net Zero by 2050 – reducing heat demand and in turn reducing the cost of retrofit.

The urgency to deliver on Net Zero has never been felt more strongly than today. Here the UK electrotechnical manufacturing industry sets out a pathway for decarbonising UK homes by 2050.



IN THIS REPORT WE SET OUT THE STEPS
WE CAN TAKE TODAY TO FUTURE PROOF
OUR HOUSING FOR NET ZERO AND FOR THE
CHANGES TO FUEL USE THAT WILL TAKE
PLACE CLOSER TO 2050.



FOREWORD

Never has the work to deliver low carbon retrofit to existing homes been more critical. Attention now has to be on delivery, and while we still wait for clarity in a number of vital policy areas that will drive this market, action can be taken immediately to secure efficiency gains for the system and in UK homes, taking forward the 'fabric first' principle.

With energy prices front and centre in the minds of consumers and industry, the drive to reduce energy use and decarbonise is more prevalent than ever. But the scale of this challenge is huge. Industry is ready to invest to deliver this, but this hinges on some important steps being taken by UK Government, and it requires collaboration across industry, public sector, training and education bodies and key supply chains to delivery action.

BEAMA is proactively engaging in related work with Government and our supply chain to address market barriers. It is essential we set out a clear roadmap for a UK retrofit program and deliver the packages of options already available to consumers today. We cannot wait for the final decisions to be made on hydrogen before we act. If we do, it will only increase the

necessary speed and cost of decarbonisation as well as increasing the risk that we do not reach the housing Net Zero requirements by 2050.

In this report we set out the steps we can take today to future proof our housing for Net Zero and for the changes to fuel use that will eventually take place closer to 2050.

**DECISIVE ACTION NOW
WILL ENSURE THE UK CAN
LEAD ON THIS AGENDA AND
WILL HELP TO ESTABLISH A
FLOURISHING GREEN JOBS
MARKET IN THE UK.**



A handwritten signature in black ink, appearing to read 'Howard Porter'.

Dr Howard Porter
CEO, BEAMA





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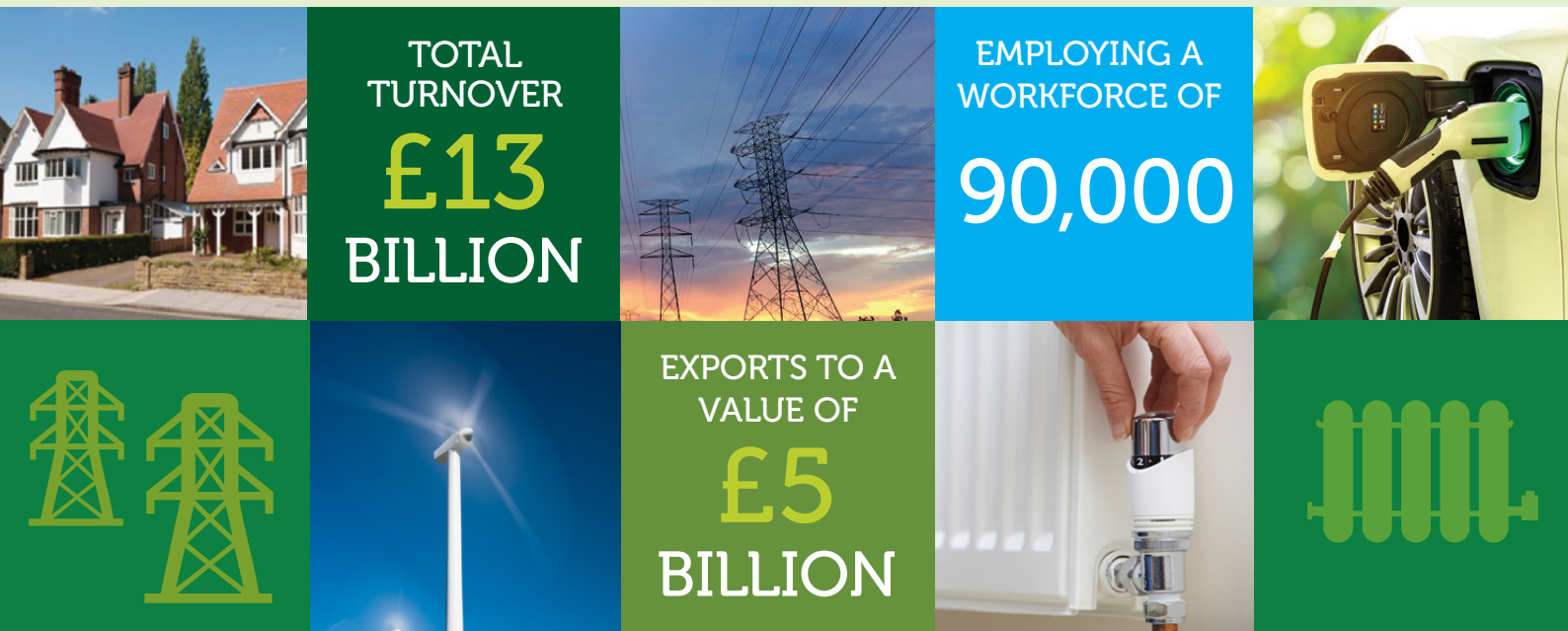
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OUR SECTOR

BEAMA is the UK trade association for manufacturers and providers of energy infrastructure and systems.

We represent more than 200 companies, from start-ups to SMEs to large multinationals. Our members provide HVAC products, EV infrastructure, electrical transmission and distribution equipment, and energy storage and flexibility assets in networks and the built environment, to support a safe and secure low carbon energy system.



OUR VISION

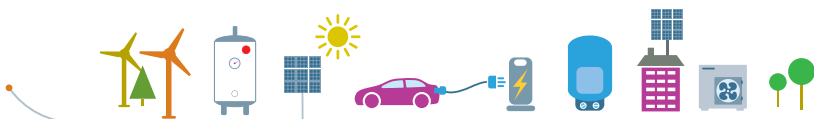
As an industry trade association our vision is to ensure and establish:

- A market for safe, secure and compliant products
- A prosperous export market for our members
- A strong investment environment for new technologies
- A low carbon smart flexible energy system
- A robust market for low carbon heating and storage

OUR TECHNOLOGIES

BEAMA's sector represents a wide range of technologies and sub sectors, including:

- Transmission and distribution equipment for the electricity grid
- Smart IoT devices for buildings
- Heating, hot water and ventilation products
- Electrical installation products for the built environment
- Storage – thermal, phase change, battery
- Electric vehicle charging infrastructure
- Smart metering



INTRODUCTION

We have less than 30 years to make UK homes fit for the future. We must prepare 29 million existing homes and millions of new build properties to use energy in a different way.

We know from the Climate Change Committee that housing is one of the key areas to be addressed to ensure Net Zero by 2050 can be met in the UK. To target such a high number of homes delivery must start now.

Our homes need to be:

READY FOR
LOW CARBON HEATING

READY FOR
ELECTRIFICATION

READY TO CONTRIBUTE
TO GRID FLEXIBILITY

READY FOR
HEALTHIER LIVING



Essential activity to insulate and improve the energy efficiency of homes is already underway, but wider improvements are needed. Homes will still use energy in 2050, yet much of the infrastructure needed for a low carbon energy system – such as a hydrogen network and a flexible electricity grid – may not be ready for years or even decades.

TIME IS NOT ON OUR SIDE. AS THE FUTURE ENERGY INFRASTRUCTURE EMERGES, OUR HOMES MUST BE READY TO CONNECT TO IT.





BEAMA has documented how we can make our homes ready for 2050¹, and we have outlined the market environment required to achieve the scale of change required across the market². In the year of COP26 our attention now turns to delivery and action. This report takes a closer look at the delivery pathway for industry and consumers between now and 2050.

This report highlights the packages of home retrofit options available to us now, and how we can roll these out to ensure we deliver Net Zero effectively and at lowest cost.

In the Climate Change Committee's progress report to Government in June 2020³ it identified 5 key investment priorities. These included investment in low carbon retrofits and buildings that are fit for the future. However, in the months that have followed we have experienced a failed Green Home Grant, and a delayed heat and buildings strategy. The future of investment in homes for Net Zero is still very uncertain, for consumers and industry.

The pathway for consumers to invest in new technology and retrofit their homes is still unclear. We know the strategic decision on use of hydrogen for heat will not be taken until 2026⁴. But regardless of dramatic progress being made in the development of a hydrogen network to replace existing gas, we know 29 million homes need to be targeted for retrofit today and the deployment and finance options for this need to be clarified as a matter of urgency.

'The heat and building strategy must take low carbon heating from a niche market in the UK to the dominant form of new heating installations by the early 2030s. It should be supported by a national effort to improve the energy efficiency of UK buildings along with ensuring their safety and comfort as the climate warms.'⁵

(the CCC progress report 2020)

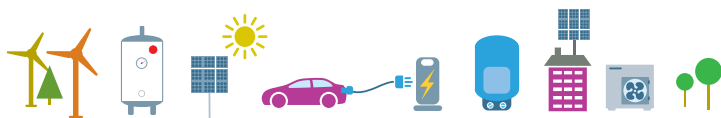
¹ BEAMA, 2020, Future ready Homes – 12 things our homes need to reach Net Zero

² BEAMA, 2019, Net Zero By Design – Developing a UK Market for low carbon technologies

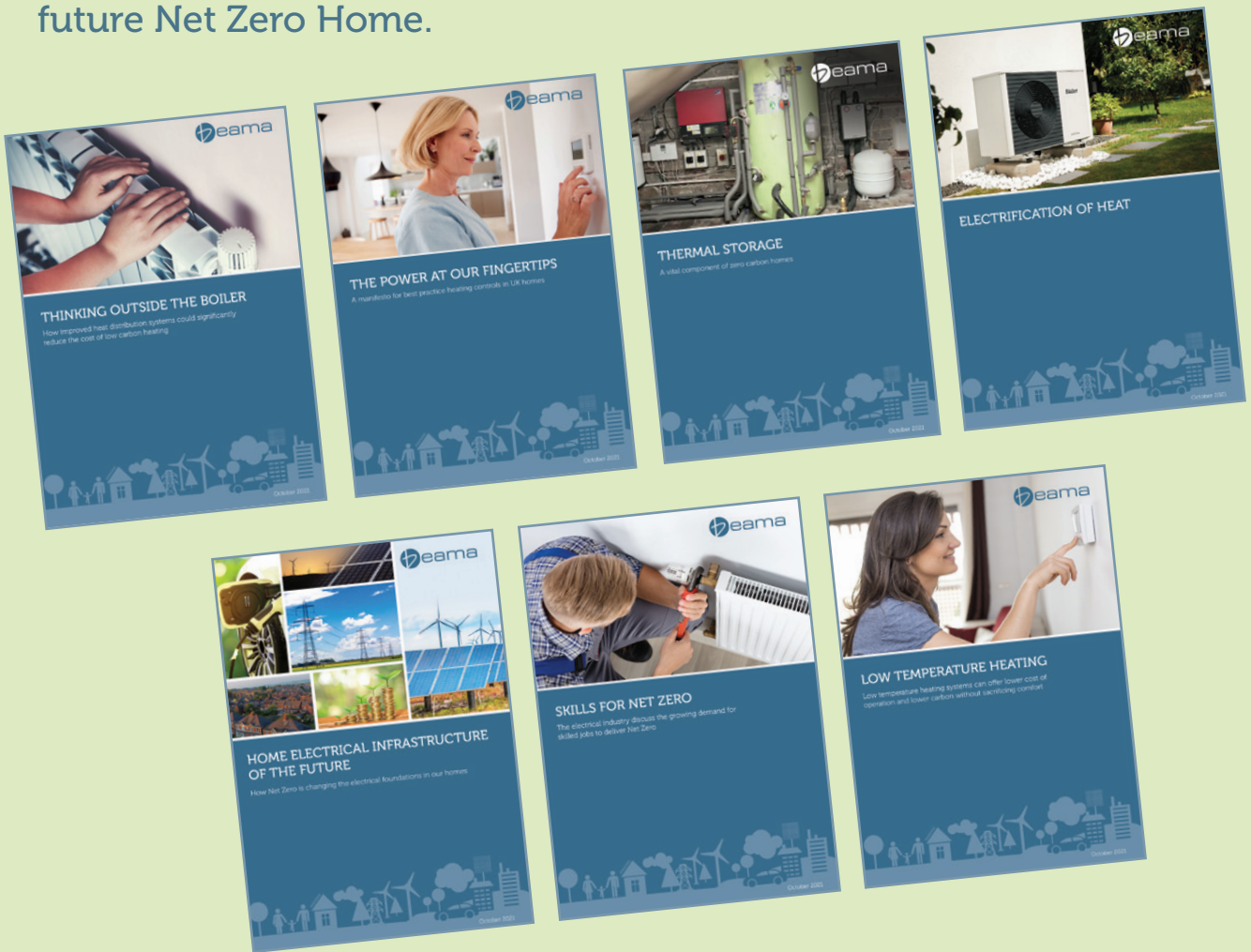
³ <https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/>

⁴ <https://www.gov.uk/government/publications/uk-hydrogen-strategy>

⁵ file:///C:/Users/Yselkla%20Farmer/Downloads/Reducing-UK-emissions-Progress-Report-to-Parliament-Committee-on-Cli...-002-1.pdf



This report is supported by a family of papers detailing the delivery pathway for specific technologies essential to a future Net Zero Home.



To read more, download the **BEAMA Net Zero by Design white papers**

[CLICK HERE](#) 



THE FACTS – A SNAPSHOT

Government targets



The Government’s Energy White Paper⁶ stated that: as many existing homes as possible should have an Energy Performance Certificate (EPC) rating of C by 2035. The English Housing Survey published in 2021, concluded that the average cost to improve dwellings to band C would be £8,100. With 14 million homes currently worse than band C this is a total cost of over £100 billion, for England alone, that has somehow to be found in the next fifteen years.

£100 BILLION needed in the next 15 years to get homes in England up to EPC band C

Energy System modelling⁶

Context

There is significant uncertainty in how the energy system will evolve over time. It will depend on several factors including policy and regulation, technology cost reductions, consumer acceptance and business model availability. BEAMA commissioned Energy Systems Catapult to develop a techno-optimistic energy system scenario consistent with the Sixth Carbon Budget, supported by the use of the Catapult’s Energy System Modelling Environment and Infrastructure Transition Analysis Model. This scenario was subsequently used to explore the consequences for the electricity system’s associated supply chain. Key energy system characteristics from this highly ambitious scenario are presented in Table below.

Quantity	Quantity present in 2020	Quantity present in 2035	Quantity present in 2050
Total electricity demand [TWh]	278	At least 377	At least 479
Heat pumps (including hybrids)	260,000 (in operation)	Potentially as high as 12 million	Potentially as high as 22 million
Domestic heat storage systems	42 GWh	115 GWh	150 GWh
Electric vehicles (including plug-in hybrids)	–	19 million	40 million
EV charging points *	–	14 - 19 million	30 - 40 million

Table 1 – Energy system characteristics based on a highly ambitious scenario

*Projected EV charge point volumes are strongly dependent on the types of charge points made available to consumers. The figures above are based on a modelled transition to a 100% EV fleet; this assumes that consumers will need access to adequate domestic, workplace and public charging. Reflecting uncertainties around future transport technologies, demand and charge point installations, 20-25 million charge points are likely to be required as a minimum. For more information refer to the associated BEAMA and Energy Systems Catapult research⁷.

⁶ BEAMA, Energy Systems Catapult – Market Sizing for Net Zero, 2021 research project

⁷ BEAMA, Energy Systems Catapult – Market Sizing for Net Zero, 2021 research project

The Climate Change Committee recommendations

Energy Efficiency – retrofit

The CCC assumed that by 2030 there would be a 17% reduction in energy demand in homes due to energy efficiency measures:

Cavity Wall Insulation	Solid Wall Insulation	Topping up loft insulation
6 million homes	2 million homes	9 million homes

Table 2 – Number of homes retrofitted with different types of insulation measures by 2030, as modelled in CCC's central scenario.

Electrification of heat – retrofit

The CCC modelling work has established that large scale deployment of low carbon heating must start before 2030. Estimates suggest an annual cost for switching to low carbon heating in the order of £15 billion.

	2030	2050
Heat Pumps	2.3 million homes	17 million homes
Low Carbon Heat Networks	1.5 million homes	5 million homes

Table 3 – Number of homes with low carbon heating in 2030 and 2050, as modelled in CCC's central scenario.

This implies that the electrification of heat will rely on retrofitting existing homes to a large extent, given the existing UK residential heating mix.

Heating system	Percentage UK housing stock
Gas central heating	81.9
Oil central heating	6.3
Solid fuel central heating	0.5
Electric central heating	0.7
Communal heating	1.7
Electric storage heaters	5.5
Gas room heaters	0.5
Solid fuel/oil room heaters	0.2
Electric room heaters	2.1
Heat pumps	0.6

Table 2 – UK residential heating mix.

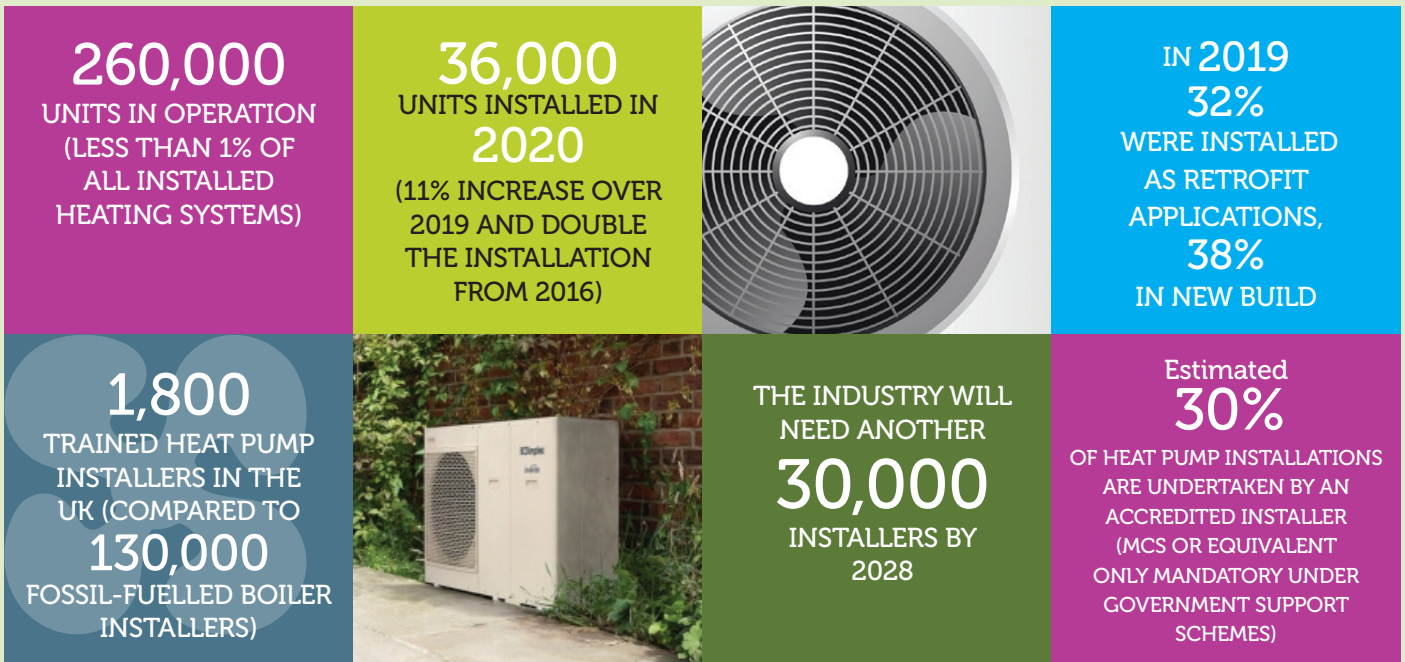
'Energy efficiency retrofit of the 29 million existing homes across the UK should be a national infrastructure priority'

Committee on Climate Change, 2019 – Net Zero – The UK's contribution to stopping global warming

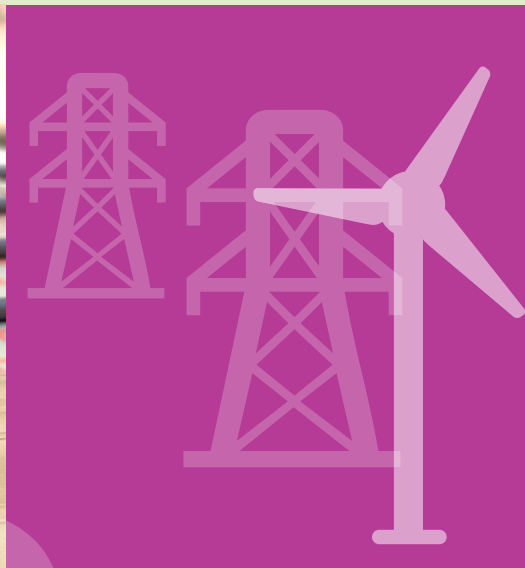
⁸ <https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future>



Heat pumps



THE GOVERNMENT IS CALLING ON THE HEAT PUMP INDUSTRY TO INCREASE ANNUAL SALES BY A FACTOR OF 17 IN 7 YEARS.



WHAT IS A ZERO CARBON HOME?

While the existing housing mix in the UK varies widely (e.g. historic, new build, off gas, high rise, detached, terraced) the options for consumers to heat and manage energy use in their home have been limited to date.

The technology now available on the market allows for a greater variety of options for households to access and manage their energy use more efficiently, delivering a more comfortable, healthy and safe environment to live. To ensure Net Zero can be met we must provide consumers with full access to the range of options on the market and allow them to select the right ones for the most suitable and affordable use of low carbon energy.

We are now able to offer technologies and services that are far more tailored to housing types, consumer usage patterns and overall family life, and there are huge opportunities in doing this, not just to cut emissions, but ensure a healthier living environment in our homes overall.

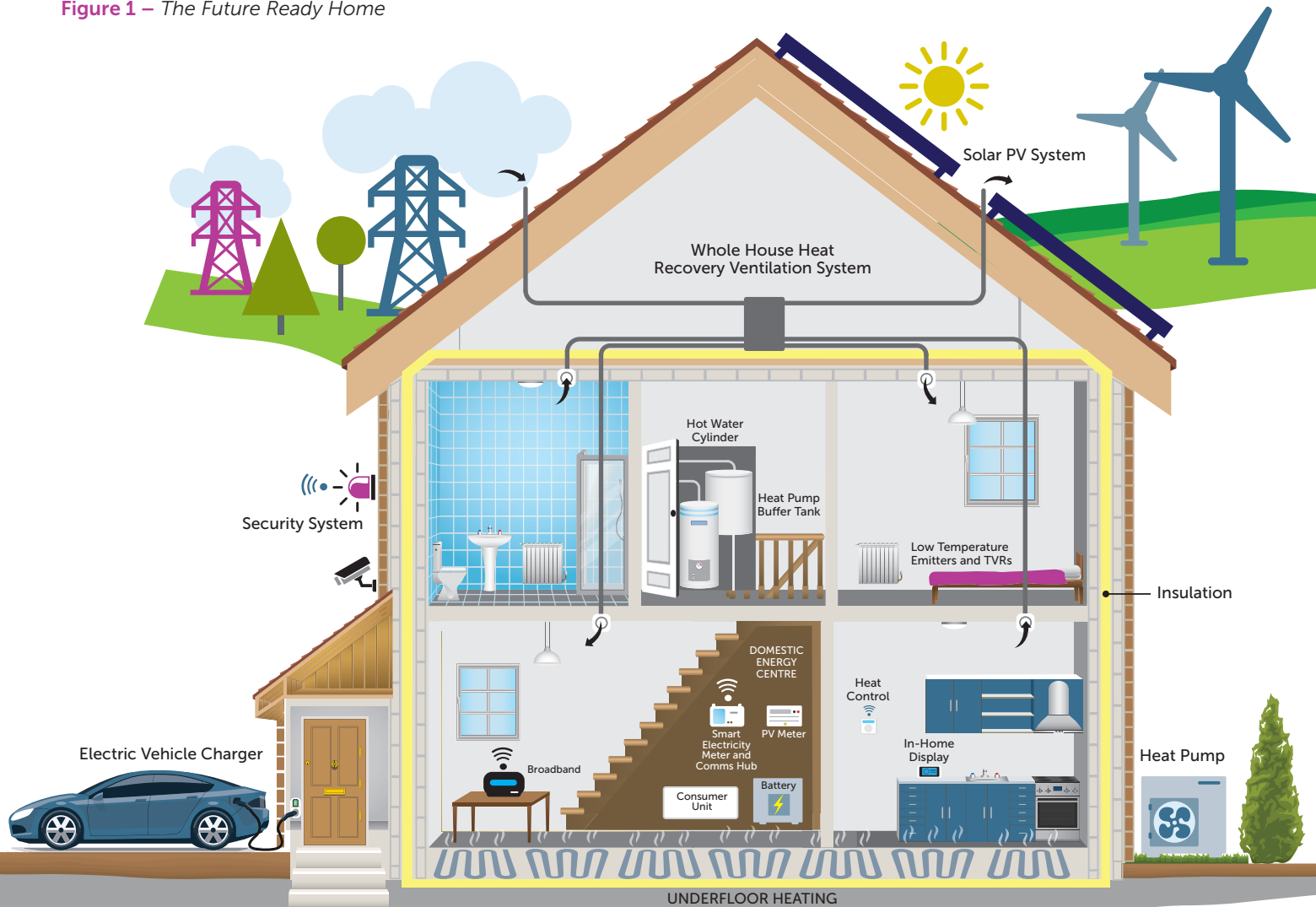
Delivering a retrofit program for Net Zero Homes is a huge communications challenge, and how we package options for consumers is vitally important to the delivery of Net Zero by 2050 in the UK. This is not a linear pathway and the examples set out in this paper highlight some of the different choices that consumers may make on the path to Net Zero.

The packages of options available to consumers today and in the future will be dependent on a variety of factors:

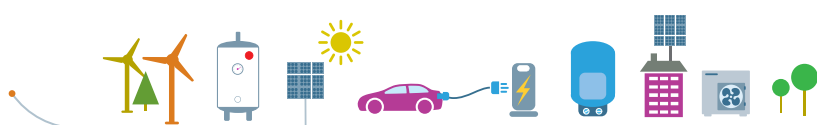
- Existing housing type and energy supply
- Energy prices – balance between gas and electricity
- Flexibility markets – the ability for consumers to access variable pricing for demand side services
- The cost of technologies
- Availability of installers
- Financial incentives – grants for upfront investment in low carbon heating

THE PRINCIPLE OF THE RETROFIT PATHWAY IS TO EQUIP HOMES WITH THE EFFICIENCY AND STORAGE CAPACITY THAT WILL FUTURE PROOF HOMES FOR HYDROGEN OR ELECTRIC HEATING UPGRADES, AND REDUCE THE OVERALL INFRASTRUCTURE COST.

Figure 1 – The Future Ready Home



The scale of the task ahead is huge, and statistics highlighted in this report demonstrate the magnitude of adaptation consumers and industry will need to make to meet Net Zero. Here we offer some insight into the delivery pathway for consumers to 2050 and summarise some key recommendations from BEAMA on how we get there.



HOMES READY FOR LOW CARBON HEATING

Equipping today's gas heated homes with the efficiency and tools to retrofit to Net Zero

A significant part of decarbonising heat in UK homes will be to change the 23 million homes (80% of the total stock) that are currently heated by a natural gas boiler to an alternative low carbon district form of heating, which is likely to be either a hydrogen boiler, an electric heat pump or connection to a low carbon district heat network.

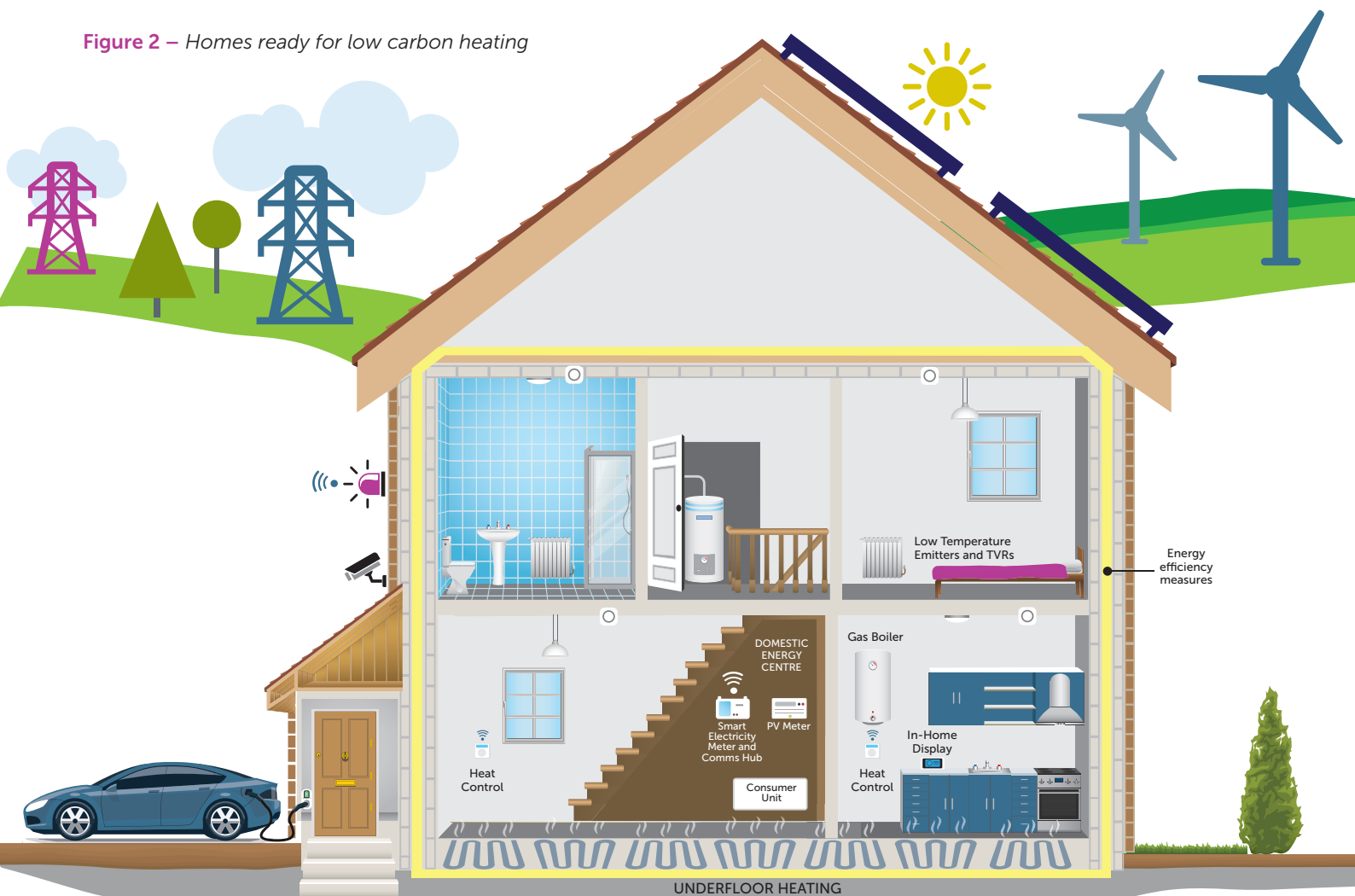
All these alternatives require the development or upgrading of infrastructure for production and distribution, and all will potentially be more expensive to consumers than using gas at its current unit price. This means that reducing the size of the heat demand from UK homes now can offer a significant benefit by **reducing the infrastructure cost of retrofit to Government and the end cost to consumers.**

We must therefore ensure we optimise any steps today to ensure efficient energy use in our homes and we equip existing homes with the tools to transition efficiently to a Net Zero Home.

All system upgrades should be done by 2040:

- Reducing CO² emissions today and;
- Ensure homes are future ready, delivering similar energy benefits for a hydrogen system or electric heat pump – less heat used now will mean lower infrastructure costs in the future

Figure 2 – Homes ready for low carbon heating





Measures to improve system efficiency have the potential to reduce current gas consumption for heating and hot water by **22%**

Saving £2 billion and 11 tonnes of CO² a year.

Maintain a hot water store

70-80% of homes no longer have a water cylinder due to combi boiler installations. Storage is needed for heat pumps and flexibility.

Solar Thermal can provide **60%** of a household's hot water needs.

Low temperature heating systems will improve efficiency and equip homes for heat pump installations.

Most boiler installations are installed to high temperature systems so changing to low temperature emitters (e.g. larger radiators or underfloor heating) will make savings today.

Combining heating system improvements with fabric energy efficiency (consistent with the CCC's recommendations), and a different approach to hot water, could **reduce gas consumption by 55%.**

System optimisation

The energy used by a heating appliance such as a boiler is largely dependent on the overall system (emitters, controls and design and commissioning).

Weak enforcement of the Building Regulations means the commissioning of systems is inconsistent and we are not optimising efficiency in the UK.

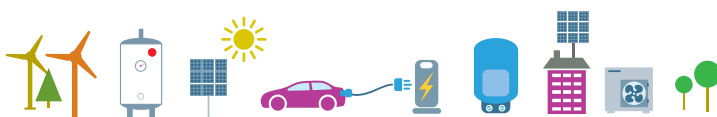
More enforcement will lead to CO₂ savings

e.g. Optimised hydraulic balancing in the UK could save 1.1mtoe from heat consumption – the BEIS Boiler Plus⁹ review revealed '*most installers do not have a common understanding of hydraulic balancing, with only 18% claiming to undertake it as standard practice*'. Yet the subsequent boiler plus requirements stopped short of taking measures to increase the level of enforcement.

1.6 million boiler replacements a year

are carried out where Building Regulations apply and reasonable improvements should be assured by the 2022 Building Regulations.

⁹ <https://www.gov.uk/government/publications/boiler-plus-initial-policy-review>



HOMES READY FOR ELECTRIFICATION

Equipping existing electric and gas heated homes today with the infrastructure they need for electrification

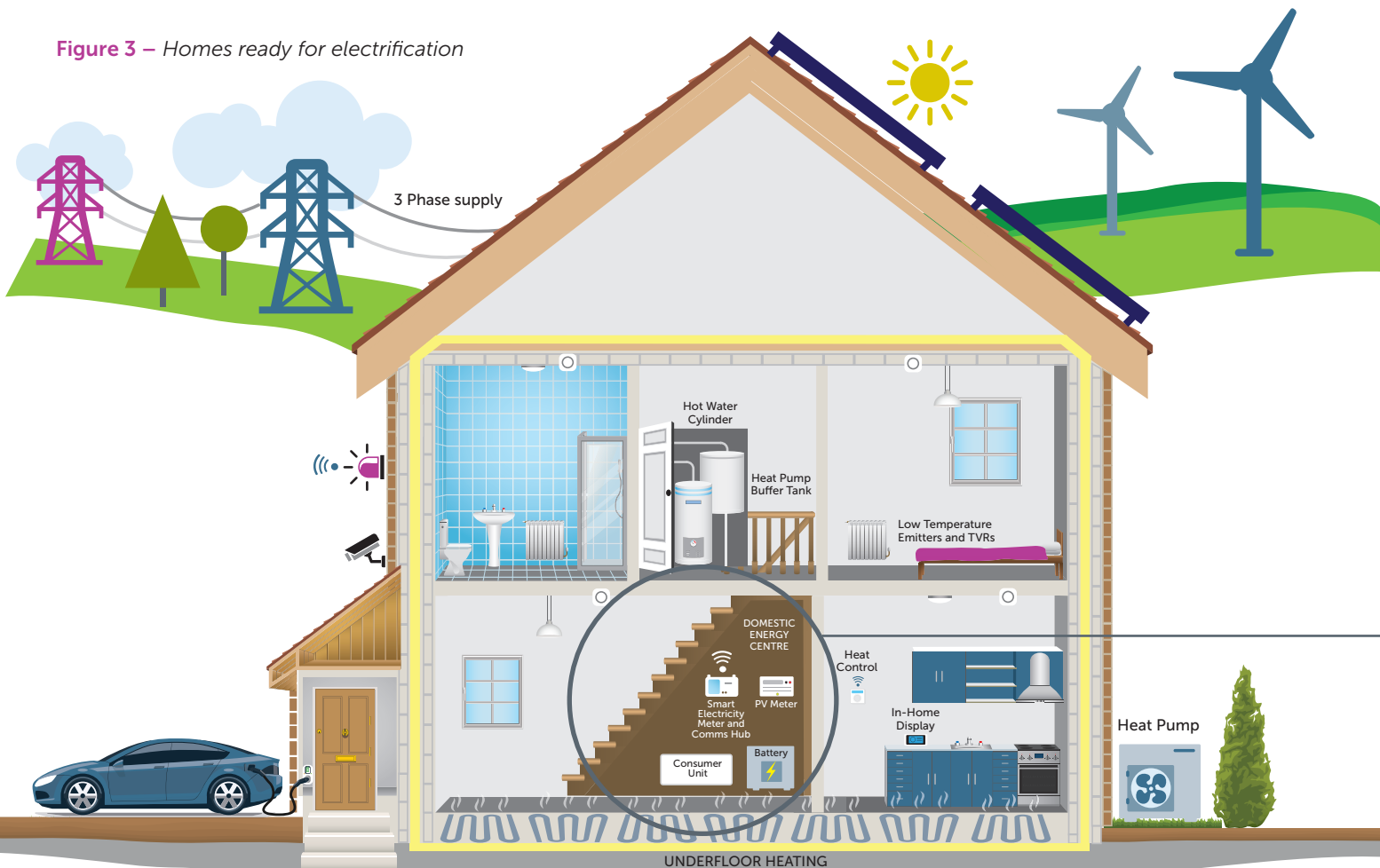
There will be varying degrees of electrification in all homes. We will see a growth in electricity demand in all homes and electrification is a major part of the solution to decarbonise transport, heat and hot water supply.

The future capacity of hydrogen networks to heat UK homes is not yet fully understood. Given what is required to generate hydrogen we can assume some of the existing 80% housing stock supplied by gas will need electric heating in the future. We will also need to retrofit some of the existing 8% of electrically heated homes in the UK. To manage this objective there needs to be consideration of the impact this will have on electricity distribution systems in the UK.¹¹

The majority of electrically heated homes today use a combination of storage and panel convactor heaters, but the Government's ambition to install 600,000 heat pumps per year by 2028 ensures heat pumps will play a decisive role in the future home.

The increase in electrical demand (479TW by 2050¹⁰) will necessitate a very different approach to managing energy in the home, and high loads from EVs and heating. It will require a new model to how we install and maintain the basic electrical installation infrastructure in a home, and here the **Domestic Energy Centre (DEC)** is born as a concept developed by BEAMA to integrate the new electrical requirements of our future home. This will facilitate the take up of EVs and heat pumps, ensuring domestic electrical wiring is safe and fit for purpose in our transition to Net Zero.

Figure 3 – Homes ready for electrification



¹⁰ BEAMA, Energy Systems Catapult – Market Sizing for Net Zero, 2021 research project

¹¹ BEAMA, Energy Systems Catapult – Market Sizing for Net Zero, 2021 research project

All information is sourced from and supported by BEAMA white papers, learn more here...

[CLICK HERE](#)



Today domestic electricity prices carry a higher share of the environmental and social obligation costs than gas.

With the rapidly falling carbon intensity of electricity, and the requirement to incentivise householders to choose an electric heating system, the distribution of these costs must be re-evaluated.

Average cost of an installed air-to-water heat pump is £10,000, compared to the average price of a replacement gas boiler of between £3-4000.

The driver for reducing the cost of heat pump installations will come from a rise in the number of installers and market mechanisms allowing for energy services to benefit consumers with a low carbon heating system.

The heating industry need to increase annual sales of heat pumps by a factor of 17 in 7 years to deliver

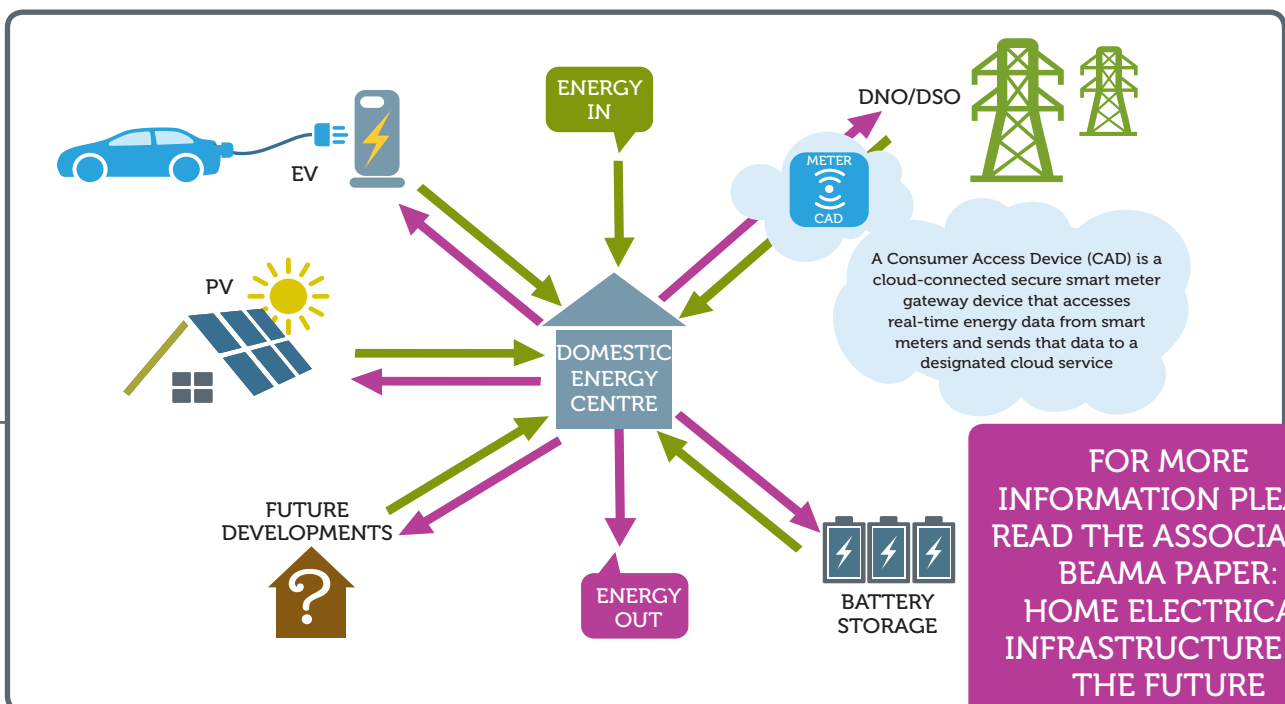
600,000
per year by 2028.

For the UK network to cope with the demands of the future, consider **3 phase supply** for new homes. This will give homes greater capacity for electric loads. (potentially multiple cars per property)

We need to train **30,000 installers** by 2028 for heat pump rollout (compared to today's 1,800 registered installers).

UK Wiring regulations

are not retrospectively applicable and therefore very old electrical installations may still be in use today.



FOR MORE INFORMATION PLEASE READ THE ASSOCIATED BEAMA PAPER: HOME ELECTRICAL INFRASTRUCTURE OF THE FUTURE

[CLICK HERE](#)

HOMES READY FOR FLEXIBILITY

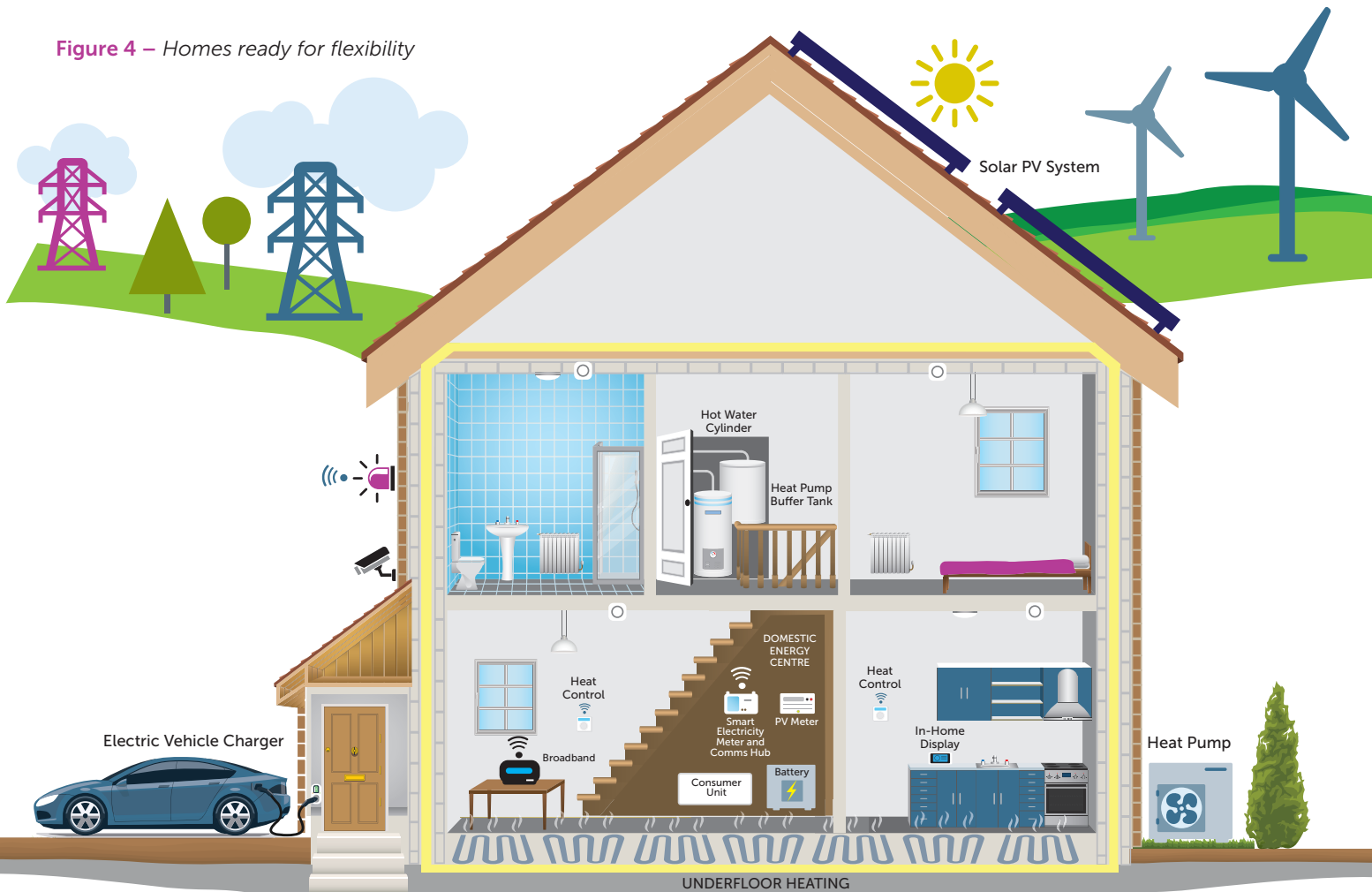
Equipping homes today with the control and storage capacity they need to benefit from demand side services

As electricity is increasingly used to supply EVs and heat pumps there will be greater loading on the power networks. To avoid the cost and inconvenience of digging up streets and installing higher capacity cables, we can use energy with greater 'flexibility.' To reward customers for accepting this, during the early 2020s there will be a growing number of domestic flexibility marketplaces emerging particularly in areas with less spare capacity. In a similar way, flexibility can be used to turn demand up and down depending on the availability of renewable energy. In this way, the stability of the power system can be ensured with less renewable generation capacity and lower costs. These services are an essential part of ensuring the affordability of home retrofit for Net Zero, reducing energy costs and ensuring adaptability to renewable energy generation at a national and local scale.

Smart technologies that enable flexibility will increase the capacity of the UK energy system to generate energy from renewable sources (e.g. solar and wind).

The connectivity of appliances, availability of data to the consumer and the marketplace, as well as storage in a variety of forms are all integral to the provision of flexibility in the home.

Figure 4 – Homes ready for flexibility



All information is sourced from and supported by BEAMA white papers, learn more here...

CLICK HERE



The Government's **smart energy roadmap**¹² forecasts a saving of **£10b/yr** from using all forms of flexibility.

Most EVs will only require a partial recharge over night so, rather than charging at peak evening times, charging can be postponed to later in the night when the demand is lower.
In this way, we can supply more total energy through the network.

Most thermal storage will be in the form of a hot water cylinder.

These are necessary for the operation of a heat pump, so they should not be removed from dwellings where a heat pump is an appropriate heating solution.

Home appliances that can advise flexibility service providers of their ability to shift their demand will be needed.

Government has been working with industry and BSI to develop standards for such appliances,
PAS 1878 and PAS 1879.¹³

These standards are intended to allow the creation of open markets for flexibility, letting customers take contracts with flexibility providers and, importantly, easily switch to a different provider later.

There are currently around **7 million hot water cylinders** in UK properties providing a potential **17.5GWh of demand response**

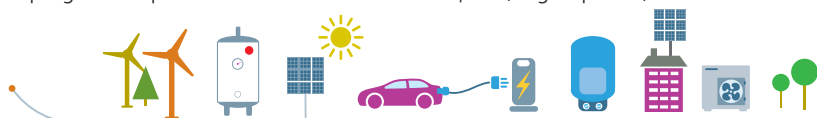
opportunity if managed correctly. This is declining at an alarming rate.



¹² Download PAS 1878 | BSI (bsigroup.com)

¹³ <https://www.bsigroup.com/en-GB/about-bsi/uk-national-standards-body/about-standards/Innovation/energy-smart-appliances-programme/pas-1878/> Download PAS 1878 | BSI (bsigroup.com)

<https://www.bsigroup.com/en-GB/about-bsi/uk-national-standards-body/about-standards/Innovation/energy-smart-appliances-programme/pas-1879/> Download PAS 1879 | BSI (bsigroup.com)



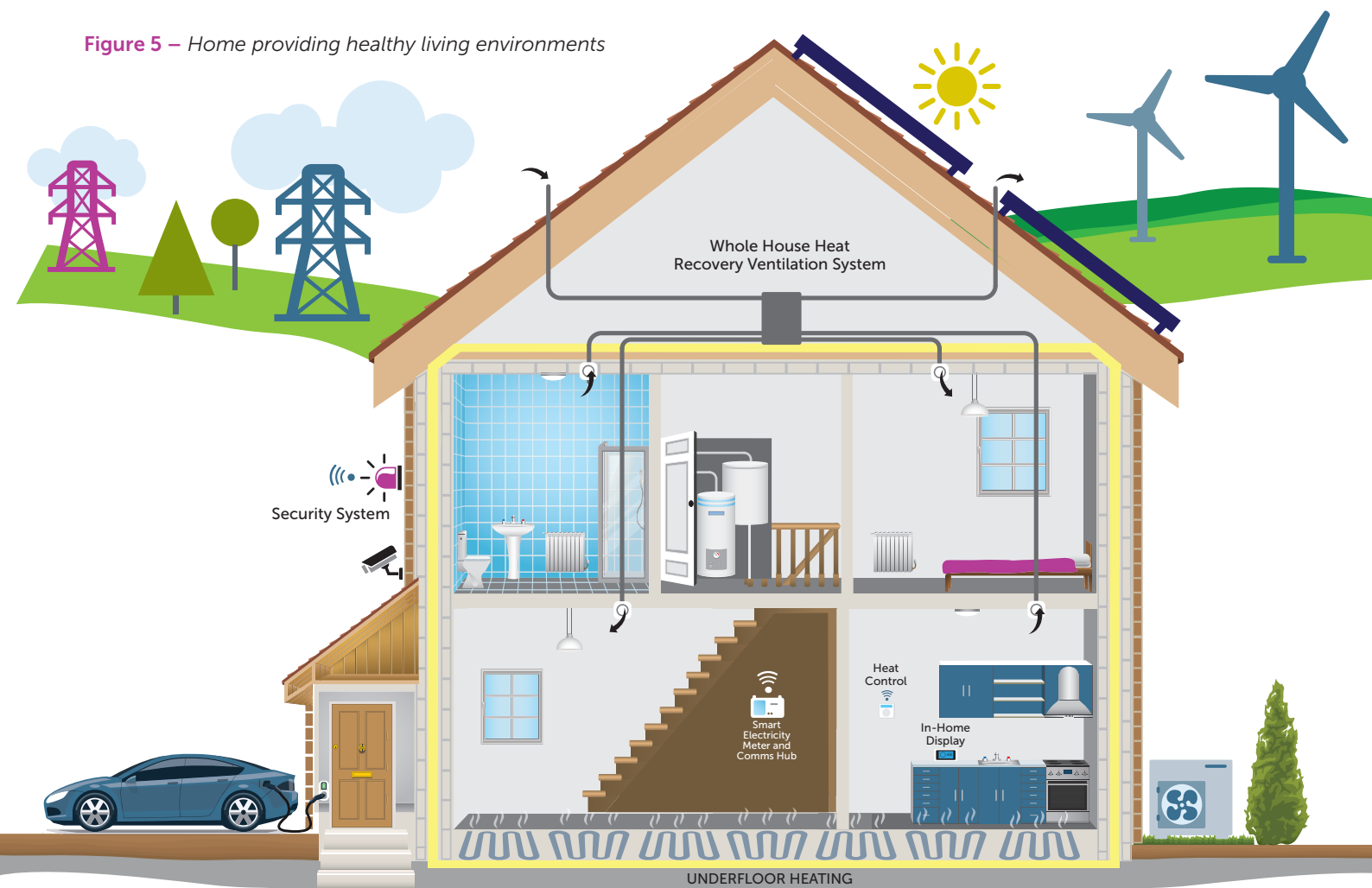
HOMES PROVIDING HEALTHY LIVING ENVIRONMENTS

Ensuring that low carbon homes are also healthy and safe

Moving homes to Net Zero is also an opportunity to make sure that they provide a healthy and secure living environment for all. Many of the necessary improvements to UK homes can improve the wellbeing of occupants, for example by providing more stable temperatures or providing better control, but not all are benign. Adding fabric energy efficiency measures will increase the airtightness of a building and therefore needs to be accompanied by suitable levels of ventilation to ensure that the indoor air quality is not negatively impacted. The development of connected devices in homes can allow for more advanced services associated with assisted living and security. For example, non-intrusive load monitoring from smart meter data for social care, or technology diagnostics to ensure that systems are working as they should.

This is also about climate adaptation and ensuring UK homes are equipped with the tools to avoid overheating and withstand extreme weather events.

Figure 5 – Home providing healthy living environments



All information is sourced from and supported by BEAMA white papers, learn more here...

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65% of UK homes contain polluted air

(from mould, condensation, products and household items).

Which is linked to skin conditions, asthma, heart disease, lung cancer.

We can reduce this polluted air through effective ventilation of the home.

Increasing insulation in homes

means they are becoming more air tight.

The Royal College of Physicians warned that indoor air pollutants cause a minimum of thousands of deaths per year in the UK and are associated with healthcare costs in the order of

10s of millions of pounds.

74% of the British public are aware that poor indoor air quality could negatively affect their health.

4.6 million homes

in the UK are affected by overheating. Government may need to explore wider options, such as the potential for heat pumps to cool as well as heat, in the context of future climate adaptation needs.

MY HEALTH MY HOME[®]

To see the BEAMA public awareness campaign My Health My Home

[CLICK HERE](#)

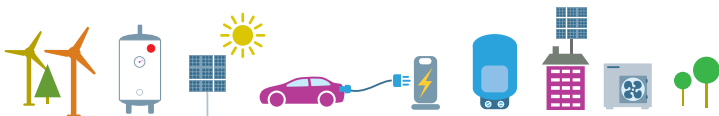


Poor IAQ is reported to have an annual cost to the UK of **over 204,000** healthy life years, with:

45% of those lost to cardiovascular diseases

23% to asthma and allergy

45% to lung cancer



DEPLOYMENT IN THE REAL WORLD

So far we have explained our sector, set out the context of the challenge, provided an outlook for scale of technology deployment, and detailed the changes that are needed to achieve zero carbon homes. In this chapter we explore various hypothetical but pertinent householder scenarios to assess existing policy support and the gaps that need to be filled to allow consumers to make changes to their homes.

This analysis illustrates that all householders need a pathway to Net Zero that would address:

KNOWLEDGE

- Is the householder aware that their home will need to change before 2050?
- Can they get advice on technology options?
- Can they get advice on practicalities of home upgrades?



AVAILABILITY OF TECHNOLOGY

- Are there Net Zero compatible products on the market?
- Are these suitable for their home?
- Is there a risk of being locked into using the wrong technology?



AFFORDABILITY OF TECHNOLOGY

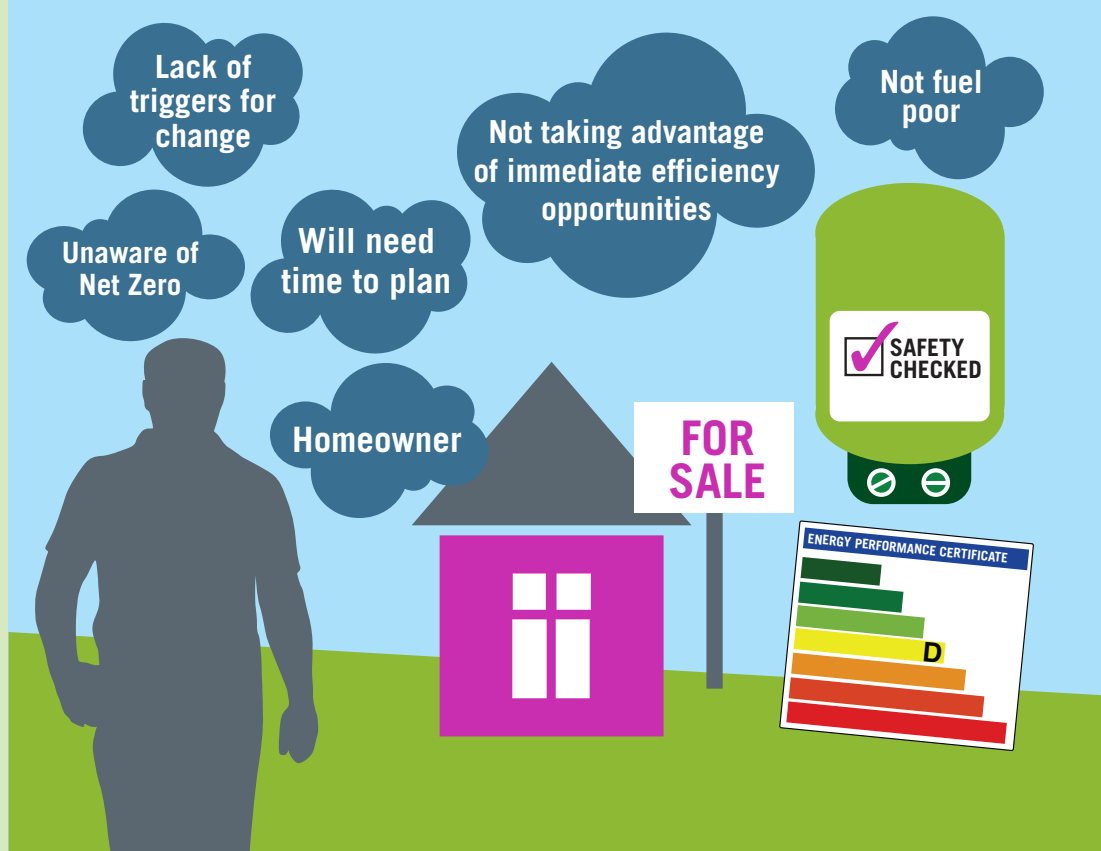
- Are there incentives or support schemes?
- Will products become cheaper through scaling up of markets?
- Are there finance options?
- Are there policy barriers?

TRIGGERS TO MAKE CHANGES

- What are the voluntary and incentivised opportunities?
- Will there be obligations on householders?
- Do Building Regulations require works suitable for the future?
- What improvements can be made while other work is being done?



CASE STUDY 1



38%
ARE UNAWARE
OF THE
CONCEPT OF
NET ZERO

HOUSEHOLDERS
WILL NEED TIME
TO MEET PLANNED
REQUIREMENTS
FOR OWNER-
OCCUPIED HOMES

CURRENTLY
THERE ARE
NO POLICIES
THAT WILL ENSURE
MR A BECOMES
AWARE OF
NET ZERO

Targeting advice for those unaware of Net Zero

Mr A is a homeowner. He is one of the 38% of people in the UK that is not aware of the concept of Net Zero¹⁴. He is likely to move home within the next 10 years. He is planning to have a gas safety check for his boiler, which he does every five years. He is not fuel poor but does not have large financial savings. His home is EPC band D.

Analysis:

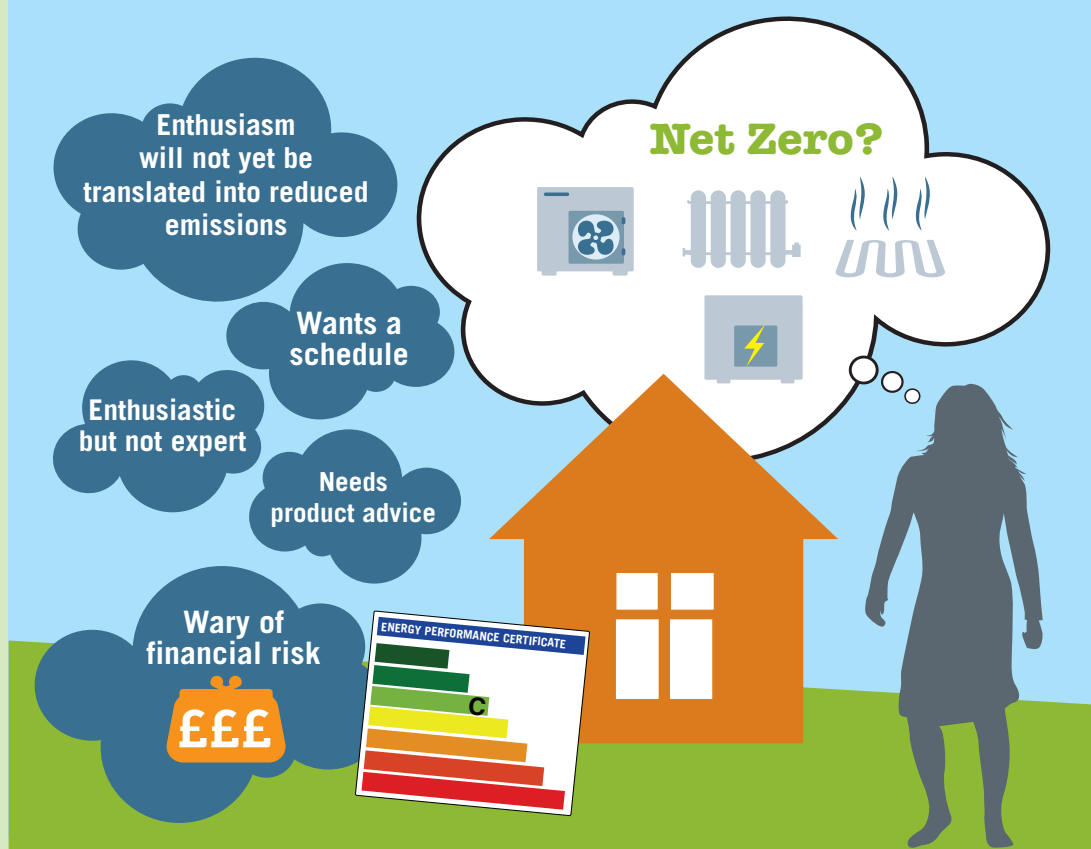
Mr A's home will need to change before 2050. UK Government has also said it will consult on minimum energy efficiency standards for owner-occupied homes, as has happened in Scotland. Mr A's lack of awareness of any of this means that he may be surprised when he looks to sell his house that there are market forces or householder obligations that will impact the price of his sale. Without suitable notice to plan, he will have difficulty finding the time and money to improve his home.

Policy gaps:

Currently there are no policies that will ensure Mr A becomes aware of Net Zero, or any requirements for him to receive advice. While industry publishes information and the Government and other organisations have advice websites, Mr A is unlikely to come across these. Mr A should have as much notice as possible to understand the changes that will be needed so he can plan for the future, especially within the context of an upcoming house move. Mr A could benefit now from measures that would also be suitable for any future heating system, but there are no trigger points to bring these about.

¹⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/985092/BEIS_PAT_W37_-_Key_Findings.pdf

CASE STUDY 2



IN SEPTEMBER
2021

NO GRANTS
EXIST FOR NON-FUEL
POOR HOUSEHOLDS
IN ENGLAND
WANTING TO
UPGRADE HOMES

CONSUMERS
NOT YET READY
FOR
NET ZERO
COULD STILL
BENEFIT FROM
FUTURE-PROOFING
IF GIVEN THE
RIGHT ADVICE

Targeting advice and finance for engaged low income homeowners

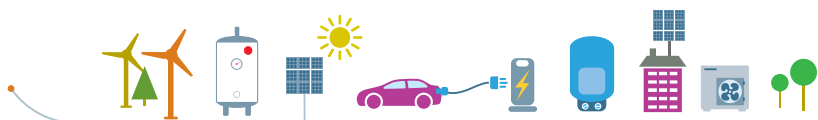
Mrs B has been reading up about Net Zero and has been looking at making changes to her home. She owns her house in England. While not fuel poor, she has relatively low income and low wealth. She is in a Band C home, but some of the rooms still get cold even with the heating on. Mrs B knows that her home will need to change before 2050, and she is keen to make an early start. However, she is not an expert in technology or the practicalities of potential home energy upgrades.

Analysis:

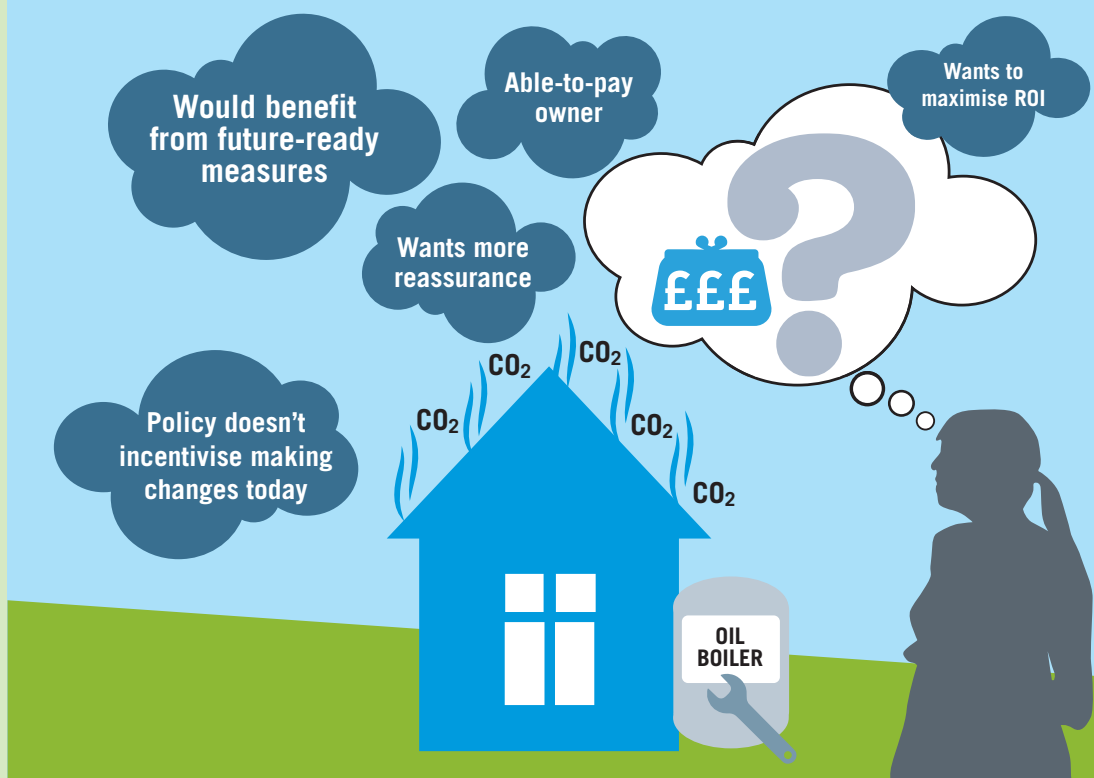
Mrs B is likely to have difficulties in finding consistent, trusted, practical advice. She lacks significant funds and has to be careful with her spending, making this quite a risky time to invest without additional measures to help. Mrs B's enthusiasm is unlikely to be translated into reduced emissions.

Policy gaps:

Mrs B needs trusted advice in the form of a consumer pathway to tell her what solutions are available now and soon. As of October 2021, Mrs B will need to wait for grant or incentive schemes to help her make changes to her home. There are not enough options yet available to give Mrs B confidence in taking out a private green finance product. She is also wary of the risk of committing to technologies that may not ultimately be the most affordable or least disruptive. With additional policy measures expected in late 2021, Mrs B may have more options soon. However, she will still need help deciding when to act and what to do. She would also benefit from learning about measures that would make a start for her Net Zero journey but suitable for all heat sources.



CASE STUDY 3



QUESTIONS A CONSUMER PATHWAY COULD ANSWER:

- What are the options for Net Zero compatible heating and hot water?
- What efficiency upgrades are needed?
- What is the potential for flexibility?
- What are the practicalities of upgrades?
- What incentives are there?
- What obligations will there be?
- What finance is available?
- What is the payback time for upgrades?

Distress purchases for off gas homes

Mrs C is a homeowner in an off-gas grid property. She currently has an oil boiler to heat her home, but it has just broken down during a cold snap and needs replacing. Mrs C has heard from her neighbours that the use of high carbon fossil fuel heating might be restricted in future, but doesn't know too much more about her options or the significance of this.

Analysis:

The immediacy of Mrs C's scenario makes it difficult for her to find any alternatives to her current heating system type. She is likely to get in touch with an installer, who is likely to specialise in oil boilers and suggest a replacement model. This boiler is then likely to last for up to 20 years, meaning higher emissions are locked in for her home. She may also find that by the end of the boiler's lifespan, energy performance is reflected in property prices.

Policy gaps:

There is no phase out date for high carbon fossil fuel boilers, meaning Net Zero awareness among off-gas grid some householders like Mrs C is not as great as it could be. This limits her ability to plan. While the RHI remains in place until April 2022 and will be replaced by a Clean Heat Grant, with the Home Upgrade Grant also helping some, as it stands these will be less suitable for distress purchases, meaning consumer pathways are needed to avoid missing similar opportunities to decarbonise. Even if Mrs C took out a Clean Heat Grant, she may also still struggle to fund the full installation cost as things stand, so would benefit from additional support resulting from better tariffs, finance offerings, a correction to the price of electricity, and a scaling up of markets for heating options. There is also a lack of support for installation of on-site generation and storage, which would complement low carbon heat and could help householders feel more energy-secure.

CASE STUDY 4



BETTER ENERGY PERFORMANCE IS REQUIRED FOR HOMES TO MEET NET-ZERO, BUT IS NOT REWARDED BY POLICY

ABLE-TO-PAY HOUSEHOLDERS ARE MOST LIKELY TO BENEFIT FROM EXISTING AND PLANNED LOW CARBON HEAT INCENTIVES

Creating the investment opportunity for the able to pay

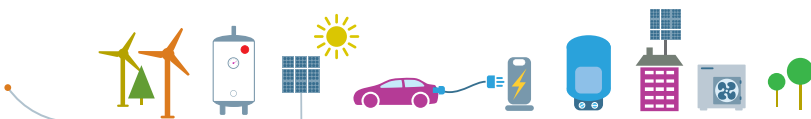
Mr D is an owner-occupier who has some disposable income and savings, making him 'able-to-pay' for his home's Net Zero transition over the coming years. His gas boiler is around 15 years old so may need replacing within the next few years. However, Mr D doesn't want to waste money, and has also heard that Government offers some financial support. He is weighing up either investing in energy improvements to his home or a new kitchen.

Analysis:

Currently Mr D could take advantage of the RHI, and from next year the Clean Heat Grant – existing and planned incentive schemes are most suitable for more able-to-pay owner-occupiers, as payments would not fund a full installation of a renewable heating system. Before making a decision about a heating system change, Mr D could also benefit in the meantime from futureproofing measures that would benefit him now and regardless of the heat source.

Policy gaps:

Even though Mr D is able to fund most of his home's transition to Net Zero, he wants to do this efficiently and as such may find it better to wait. Many underlying policies that will determine value for money are not yet in place. For example, Mr D would benefit if improvements in his home were formally recognised in some way so that his property becomes more of an asset – for example a measure of smartness, or a link of energy performance to stamp duty. He also wants to be reassured about bespoke skills so he won't have to wait too long and so he can be confident that installations will be done perfectly. He has also noticed a lack of consistency in policy and wants more reassurance to be able to feel secure in his investment.



CONCLUSION

The political imperative to deliver on Net Zero has never been stronger, yet progress in the UK to reduce emissions and meet our existing carbon budgets has been slow.

What we set out in this report is a summary of the steps we can take now to equip UK homes for Net Zero. There are many 'no regret' transitional measures which should be enforced through regulation or incentivised through fiscal measures so that existing barriers to delivering these can be overcome and their implementation happen as quickly as possible.

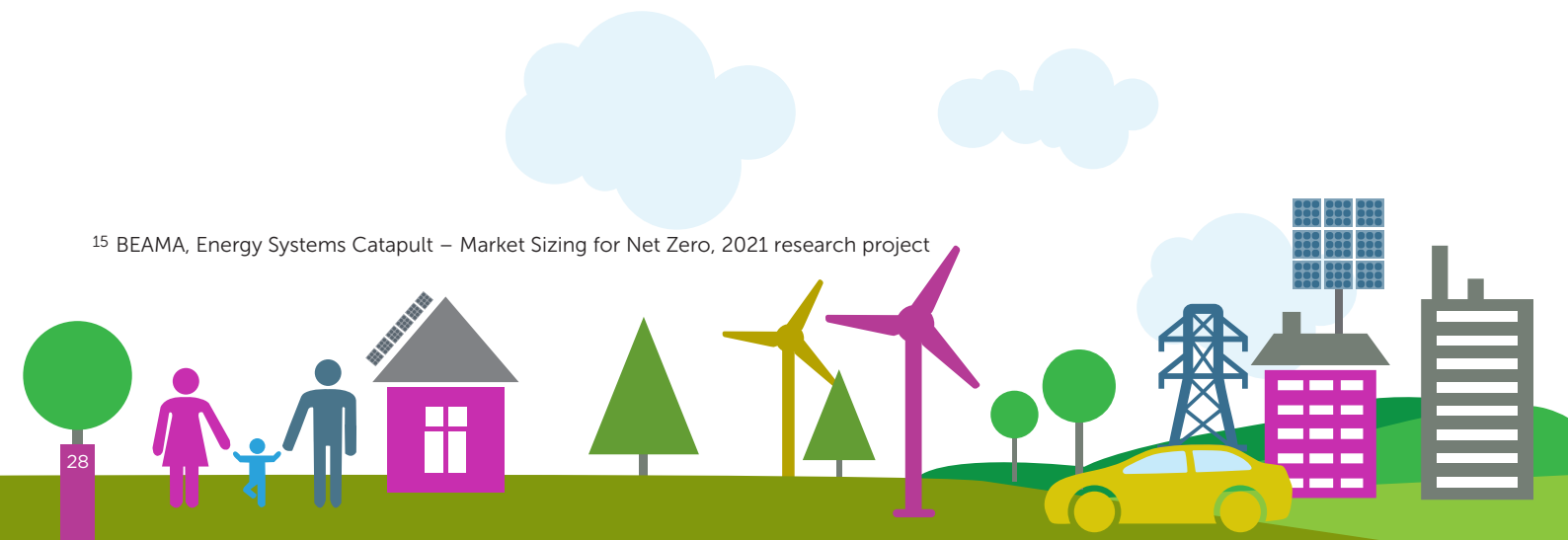
In many cases existing regulations are already moving us in the right direction, but lack of enforcement is leading to sub-optimal outcomes. Industry and consumers need confidence in the Government's commitment to deliver change and a clear pathway for delivery that will result in 2050 targets being met.

**IF WE DO THIS WELL FROM THE START
WE WILL MEET NET ZERO AT LOWEST COST,
SAVE CONSUMER ENERGY BILLS, AND CREATE
A HEALTHIER, SAFER MORE COMFORTABLE
LIVING ENVIRONMENT FOR UK RESIDENTS.**

There remain supply chain constraints in delivering the volume of products needed onto the UK market to meet Government targets for some product areas. BEAMA has conducted research with the Energy Systems Catapult to analyse these constraints in more detail¹⁵. We believe all these can be overcome with improved confidence in the long-term market growth and policy direction.

The following recommendations summarise a range of actions that are needed.

¹⁵ BEAMA, Energy Systems Catapult – Market Sizing for Net Zero, 2021 research project



RECOMMENDATIONS

Market certainty

Government and industry need to urgently agree a detailed roadmap and delivery plan for a defined range of packaged solutions, incorporating the technologies highlighted in this report, as part of a national retrofit program starting today. The aims of this program should include:

- Providing consumers with certainty on the heating options that will be available to them in the future
- Targeting fabric and heat distribution system efficiency improvements in all UK homes
- Upgrading existing electrically heated homes to low carbon alternatives
- Specifying low carbon heating options for off-gas grid homes
- Improving the health of occupants by deploying mechanical ventilation solutions alongside home energy efficiency upgrades
- Including electrical safety upgrades for future electrification
- Identifying and supporting options to improve flexibility opportunities in homes

48%
of social housing providers feel policy is unclear¹⁶

This roadmap needs to establish the market certainty needed to ensure investment in manufacturing, training and delivery programs, this will only be provided from:

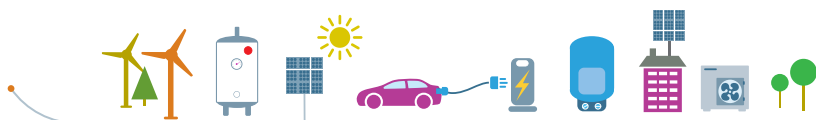
- A clear delivery pathway
- Long term financial stimulus
- A rebalance of energy prices and long-term commitment to this adjustment
- Clarity on the delivery of flexible energy services for demand side response

Finance

- **Define funding mechanisms and financial incentives to deal with the upfront capital cost of low carbon heating – linked to a clear roadmap of system improvements and retrofit options. Increasing the maximum grant in the Clean Heat Grant and extending it to 2028 will help deliver the aims of the 10 Point Plan.**

One of the issues for incentives, such as the Green Homes Grant, is heating system measures, particularly on the system side, are not adequately defined. With a clearer roadmap for system improvements and a defined list of packages of measures Government would be in a better position to incentivise these heating improvements. In particular, there should be defined levels of good practice above the minimum standards in Building Regulations that could be incentivised, and such incentives could be linked to opportune times. For example, at the time of a boiler replacement there could be flexible grants to encourage more than minimum standards of work to be undertaken – even when this replacement is a distress purchase. Working with industry Government can facilitate the development of unbiased advice to consumers to support incentives.

¹⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1023608/social-housing-decarbonisation-study-report.pdf



The cost of some low carbon solutions is more expensive than their higher carbon alternatives. Some financial incentive is required to incentivise take up. There are examples of historic policy stimuli the UK have introduced to do this, but in many cases with limited impact compared to the scale of change we now need in the UK (E.g. Renewable Heat Incentive, Green Homes Grant). We can learn from mistakes made here, improve the administration of schemes to ensure efficient delivery.

Financing options include:

- Stamp duty rebates
- Tax reductions such as VAT-free purchases
- Facilitate easy access to private finance
- Carbon taxes to incentivise the shift away from fossil fuels
- Re-evaluate the relative cost of energy

Government must demonstrate that as a critical component of UK energy policy, the decarbonisation of heat, will be supported by a stable, long term policy environment and address distorted fuel price mechanisms that may inadvertently prolong the use of fossil fuels.

Effective regulation

- **Ensure Building Regulation mechanisms are updated to follow the pathway set out for system improvements and support the delivery of packages of measures.** This includes updating mechanisms such as SAP to appropriately recognise smart technologies and flexibility services. We also need to ensure mechanisms such as the Energy Performance Certificates (EPC) contain metrics that lead to reduced emissions, not just the least cost solution.
- **Enforcement of existing regulations and standards:** This is essential to ensure the efficiency of UK homes and calculated savings are being made. Suitable means to ensure compliance are already set out in Building Regulations and these need to be robustly enforced. The new Building Safety Regulator defined under the Building Safety Bill must take forward their powers to set minimum performance standards that building control bodies must meet and to act against those found to be underperforming.
- **Broaden the scope of compliance in the Future Homes Standard:** Building Regulations for the energy performance of new homes from 2025 should be broadened to encompass associated requirements for those homes to have a suitable electrical infrastructure to support future electrification, and a minimum level of grid flexibility readiness.
- **Government should lay out a plan for the progressive increase in the minimum standards that will be required when a boiler (or other elements of a heating systems) is replaced.**

System and efficiency upgrades

- **All system upgrades to UK homes should be complete by 2040. This would ensure that efficiency and future ready systems are available for the final stages of heat decarbonisation as well as maximising the carbon saving benefits of these measures within the existing housing stock:** We can make relatively low-cost system upgrades to all UK homes equipping them for the future, reducing future infrastructure costs and saving CO₂ immediately. These efficiency gains can be made largely by ensuring the enforcement of existing UK Building Regulations.
- **Match energy efficiency retrofits with improvements in ventilation and indoor air quality.** As part of its goal to raise all homes in England to EPC rating C and its wider Net Zero strategy, the Government should include the provision of ventilation to recognise the need to 'ventilate

when you insulate.’ Targets should be set for all existing homes to reach EPC rating C and at the same time to have a ventilation system that complies with Part F of the Building Regulations.

- **Industry to adopt the use PAS 1878 and 1879:** Published in May 2021 industry is now working to create compliant appliances and control systems. BEAMA has been developing a roadmap with BEIS, BSI and industry stakeholders that will deliver these appliances and services, creating export opportunities for this new technology¹⁷. A major challenge for this work is designing standards that allow the market to develop but without impeding the rapid innovation in digitalisation. This will also help deliver greater interoperability to avoid consumer ‘lock-in’ with emerging technologies.

Campaigns for consumer and industry take up

- **Improve consumer awareness:** arguably this is the greatest challenge of all. With a clear pathway and roadmap alongside packages of measures for consumers the Government and industry need to embark on a significant communications program for consumers and installers. What will be essential is for all elements of the supply chain to be working together to deliver low carbon solutions, so that consumers get a Net Zero pathway for their home and can access expert advice and appropriate choices from whoever they seek solutions for building, heating or electrical work.
- **Improve training and skills for a national retrofit program:** With a clear shortage of trained installers and the skills required in the market to deliver retrofit at scale, this is a key factor now affecting much needed supply chain investment. We ask Government to collaborate with Further Education Institutions and help industry engage with them to ensure there is a focus on low carbon heating training to establish and maintain the high standards and rapid deployment growth.

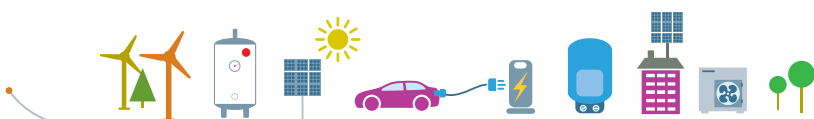
Train 30,000 heat pump installers by 2028: Industry have acknowledged they have capacity to train 7,000 new installers per year (it will need to ramp up to this level over the course of several years). So there is potential capacity to deliver the 600,000 heat pumps per year by 2028.

Colleges and manufactures will only support training if they see demand from installers and the marketplace. This is the root of the problem facing the UK’s delivery target for heat pumps. Installers are yet to demonstrate this demand as they don’t see significant value in this training and the associated heat pump installation market. If we are looking at re-training existing gas engineers, the boiler installation market is still a more profitable option.

Installers need market certainty from long-term policy and clear government support packages.



¹⁷ Energy Smart Appliances standards programme - PAS 1878 and PAS 1879 development stage: Roadmap for PAS implementation and next steps



This report is supported by a family of papers detailing the delivery pathway for specific technologies essential to a future Net Zero Home.



For more information and to speak to BEAMA about this work please contact info@beama.org.uk

To read more, download the **BEAMA Net Zero by Design white papers**

[CLICK HERE](#)





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