February 2025

Making Performance-led Home Retrofit a Reality

A Discussion Paper by the
Mineral Wool Insulation Manufacturers Association (MIMA)

MINERAL WOOL INSULATION MANUFACTURERS ASSOCIATION

About MIMA

The Mineral Wool Insulation Manufacturers Association (MIMA) is a trade body providing an authoritative source of independent information and advice on non-combustible glass and stone wool insulation. We represent leading mineral wool insulation companies in the UK, promoting the benefits of mineral wool insulation and the contribution it makes to the energy efficiency of buildings and the comfort, health and safety of their occupants.

Disclaimer
All examples, case studies, and references used in this paper were accessed prior to 16 January 2025 and have been used for illustrative purposes only. They are not an endorsement by MIMA of the commercial offers or approaches to building retrofit quoted.

Contents

1. Introduction

This paper by the Mineral Wool Insulation Manufacturers Association (MIMA) proposes a policy approach to delivering home insulation, fabric upgrades, and heat decarbonisation which has a simple set of guiding principles:

1

Moving to a national policy framework in which Retrofit Providers are supported in routinely testing and checking how homes perform in practice once they are upgraded...

2

Enables and encourages more companies to innovate to bring forward guarantees related to certain outcomes of retrofit projects, such as guaranteeing quantified reductions in home heating demand...

3

Which helps to grow consumer trust and confidence in home energy upgrades and support for Net Zero buildings more generally.

We are now in an era where an increasing number of relatively low-cost, low-disruption technologies and methods exist to measure how homes are actually performing in terms of their heat demand, energy use, and emissions, meaning Retrofit Providers and their customers no longer need to rely solely on modelled estimates which can differ significantly to measured results.

For instance, it is now possible to measure the heat loss of a building relatively rapidly without the occupants having to move out, or to have a heat meter installed with a heat pump to allow its real-time and average yearly efficiency to be checked, interfacing easily with a homeowner's smart phone or tablet.

Box 1 | The value of verifying building performance

MIMA has a long-standing record of conducting research, advocating for policy, and developing high-performing mineral wool insulation systems which support the retrofit industry in closing gaps in performance between the design intent of energy efficiency measures and their actual performance in use.

Net Zero will require many consumers to make significant changes to their homes, including the way they are heated. As an industry, if we can commit to checking, verifying, and potentially guaranteeing aspects of building performance as the stock is decarbonised, we take many of the real or perceived risks of the transition off the shoulders of householders and onto ourselves.

This ability to more easily measure, meter, and monitor a building's energy performance is a game-changer for the future of retrofit and decarbonisation policy, meaning consumers can be given greater assurance of a good outcome.

New, accredited technologies for measuring real building performance also open the door to all kinds of exciting guarantees being offered by Retrofit Providers including heat pump efficiency guarantees, assurances that insulated walls, floors, and roofs are reducing heat loss as intended, and pledges and guarantees to 'meet or beat' the running costs of a household's fossil fuel heating system when switching to a low carbon heating alternative such as a heat pump.[1] These are market offerings MIMA is calling 'Outcomes-Based Guarantees'.

Being able to reassure, guarantee, and prove to a homeowner that they will get a good retrofit experience with a positive outcome is important for overcoming a barrier to progress in upgrading and decarbonising the building stock: the need for strong consumer trust and confidence in the process.

And it's not only about trust but realising important wider benefits for the country. For example, good insulation working as intended can make a home healthier and safer.[2] We must also ensure fuel poor households and those living in sub-standard housing get real, reliable energy performance improvements and comfort gains.

For the electricity grid, as we electrify heat alongside reducing overall residential heat demand, we must feel confident in reducing peak heating loads and grid reinforcement costs, in reality, not only on paper. Meeting peak heating demand across the day and over a year – including during cold snaps – is likely to be a particular challenge for the future electricity supply system, and an even greater challenge if we were to use more energy for heating than models predict.

Widespread building energy performance testing and availability of Outcomes-Based Guarantees also means we can measure and verify more of the actual energy and carbon savings achieved for carbon targets. And for the retrofit industry, checking performance and guaranteeing our installations 'do what they say on the tin' has many business and reputational benefits.

So why isn't such testing and checking the norm already? What policies can enable this to happen and what is already being done? What might a long-term performance-led retrofit policy framework look like, and what is insulation's role in this?

This paper makes seven recommendations for government policy and industry standards on these themes.

[1] See Section 3 and A heat pump might be a lot cheaper than you think: here's how - Which? News

[2] See Section 5. Mineral wool insulation, for example, is non-combustible and therefore contributes to delivering fire safe buildings.

Box 2 | Our focus

The focus of this paper is on the links between building fabric performance and low carbon heating systems such as heat pumps, in existing UK homes. It is not a technical paper. The goal is to set out high-level policy proposals for the Government and for industry to help secure good, assured outcomes for consumers when upgrading these aspects of their homes.

By 'fabric performance' we mean how well a building retains heat due to the level of insulation, the quality of the glazing and doors, and improvements in general air tightness.

References to 'heat pump' usually mean a low-temperature Air Source Heat Pump (ASHP), but the principles and proposals discussed should apply to any form of low carbon heating system which uses electricity. SCOP is the Seasonal Coefficient of Performance, and SPF is the Seasonal Performance Factor.

'Retrofit Provider' means a person or company contracting with a customer to carry out work to a property to improve its quality, energy, and carbon performance. In certain sections of the paper, Retrofit Provider also refers to sub-contractors carrying out home upgrades, including installers. It is not a legal term.

'Customer' means a person or organisation contracting with a Retrofit Provider. Hence, customers will range from private homeowners and landlords upgrading a single property, through to organisations commissioning large-scale retrofit projects, such as a social housing provider.

We would also like to make clear that although this paper focuses on low carbon heating systems and fabric improvements, best practice is that these measures sit within a whole-building approach to retrofit, for example, as set out in PAS 2035:2023[3] or the new RICS Residential Retrofit Standard.[4] Broader aspects of retrofit delivery remain critical, such as performing a technical building assessment to check for the suitability of measures and ensuring a home is adequately ventilated.

In addition, our proposals on measuring, metering, and monitoring of fabric and heat pump performance also fall within a broader Building Performance Evaluation (BPE) context,[5] recognising that measuring and metering provides valuable information about whether a building is performing well, but that if problems are uncovered, further diagnostic and remedial works could be needed. See more in Section 4.

Lastly, MIMA's recommendations are intended to encourage Retrofit Providers to come forward with an ever-growing range of market offerings which we are calling Outcomes-Based Guarantees. Different to existing guarantees concerned with protecting consumers by rectifying any problems and defects found with a given installation, Outcomes-Based Guarantees are optional contracts with customers whose terms assure or guarantee certain outcomes of a home upgrade such as an agreed energy saving in kWh or heating system efficiency. See Section 3.

We anticipate that the government may wish to define certain terms or the scope differently.

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3 See pas_2035_2023.pdf (bsigroup.com)
4 See residential-retrofit-standard_march-2024-1.pdf
5 For example, BPE guidance is given in Planning BPE: where to start and common techniques - Building Performance Network and British Standard BS 40101 Building performance evaluation of occupied and operational buildings - Building Performance Network

2. Summary of MIMA's proposed policy framework

MIMA's overall ask is for UK policy frameworks and industry standards to proactively drive and set clear targets for all Retrofit Providers who provide fabric upgrades and clean heat installations in homes to be in a position to offer their customers checks of the actual performance of those measures, in use. This means growing supply chain capacity so that, gradually, every household commissioning such a retrofit project is able to find a Retrofit Provider offering testing and checks of performance, even if they ultimately decide not take up this service.

Recommendation 1: Government to set an aspirational Target in the Warm Homes Plan to make measuring, metering, and monitoring of home energy performance the norm.

Detail: Government to set a Target in the Warm Homes Plan that by 2030 all UK households getting a home fabric and/or clean heat upgrade will be able to opt for a service from their Retrofit Provider which includes checks of the actual performance of the fabric and clean heating system, pre- and/or post retrofit as appropriate, using accredited methods, technologies, and forms of monitoring.

Relevant industry standards would require Retrofit Providers to demonstrate that an offer to measure, meter, or monitor the fabric and/or the heating system has been made to customers.

Building on this recommendation, Section 3 then explores some of the types of Outcomes-Based Guarantees already on the market and the benefits they provide. These Outcomes-Based Guarantees are optional offers to customers whose terms assure or guarantee certain outcomes of a home upgrade. Three critical 'enablers' will help to grow the number of Outcomes-Based Guarantees on offer, and these are summarised below and discussed in more detail Section 4.

Important enablers of Outcomes-Based Guarantees are:

- Driving-up measurement, metering, and monitoring of building performance, hence our recommendation to formalise a 'direction of travel' in an official national Target;
- Pressing on with insulating and improving the fabric of homes to permanently lower the amount of heat people require to stay warm (space heating demand) and reduce their fuel bills; and
- Supporting industry in continuing to raise the efficiency of clean heating systems to minimise the amount of energy they use (energy consumption for heating).

The less energy a household requires to stay at a comfortable temperature, the less energy they consume, and the lower their heating bills and carbon emissions will be. Great outcomes, especially when assured by guarantees.

Another important outcome is for low energy, low carbon homes to be comfortable, healthy, and safe to live in. Without achieving this, consumer satisfaction cannot be expected. These outcomes are especially important for vulnerable and fuel poor households, living in cold, damp homes, and are explored in Sections 4 and 5.

The paper concludes by making high-level recommendations in Section 6 for policy frameworks, the Warm Homes Plan, and industry standards to aid the transition to performance-led home retrofit.

Box 3 | Consumer confidence

"We're undoubtedly at one of the most critical turning points for humanity. Our research shows that consumers are up for the challenge and want to adopt more energy efficiency changes at home. We need to harness that willingness. By developing public trust and confidence, adoption of energy efficiency measures can become mainstream. Only then can the UK achieve its green transformation." *Nesta, 2021*[6]

"Barriers [to retrofit] common to all residents include: the hassle factor of clearing space and getting work carried out, lack of knowledge about why bother with this at all, the cost vs perceived value, and lack of trust in tradespeople and quality of their work." *UKGBC, 2021*[7]

"It is critical that UK businesses and governments build consumer trust in the transition and the technologies needed to get us there [to Net Zero]. Consumers and businesses need to be confident in their investment decisions and the outcomes they aim to deliver." *SEA, 2024*[8]

Box 4 | A framework for performance-led home retrofit

Outcome wanted	Consumer trust and confidence in home energy efficiency and clean heat upgrade projects is high due to households getting reliably good, proven outcomes, creating further widespread support for national building retrofit and successful delivery of the Net Zero buildings mission.
Mission for the Warm Homes Plan[9]	Government to set a Target in the Warm Homes Plan that by 2030 all UK households getting a home fabric and/or clean heat upgrade will be able to opt for a service from their Retrofit Provider which includes checks of the actual performance of the fabric and clean heating system, pre- and/or post retrofit as appropriate, using accredited methods, technologies, and forms of monitoring. See Recommendation 1.
Rationale	The target for testing enables and encourages Retrofit Providers to innovate and come forward with an ever-growing range of market offerings which we are calling Outcomes-Based Guarantees, if they choose. Different to existing guarantees concerned with protecting

6 See decarbonisinghomes.pdf (nesta.org.uk)
7 See Retrofit-Playbook.pdf
8 See Policy-Barriers-and-Solutions-for-a-Technology-Agnostic-Approach-to-Heat-and-Buildings-1.pdf
9 See Make-Britain-a-Clean-Energy-Superpower (labour.org.uk)

	consumers by rectifying any problems and defects found with a given installation, Outcomes-Based Guarantees are optional contracts with customers whose terms assure or guarantee certain outcomes of a home upgrade such as a specified heating system efficiency or agreed energy saving in kWh assessed under standardised or set conditions. This is a 'consumer first' approach which takes the risk of a poor outcome off the householder and on to the industry.		
Enabling Outcomes-Based Guarantees	The Government can drive the market for Outcomes-Based Guarantees which cover a range of outcomes including home energy performance, heating costs, and/or comfort/health by announcing policies which: 1) Support the 2030 Target by incentivising, rewarding, or where appropriate, requiring fabric and clean heat upgrade Retrofit Providers to offer accredited measurement, metering, and monitoring of performance as part of their service, alongside diagnostic and remedial action if under-performance is discovered. 2) Drive down up-front retrofit and home heating running costs for all, for good. Future policies should act in tandem on all three determinants of heating costs: heat demand, heating system efficiency, and energy unit prices. The goal is to de-risk delivery by ensuring no single element of the 'Affordability Equation'[10] is overly relied on to lower people's energy bills. 3) Build on recent energy efficiency policy announcements[11] and step-up support for the joined-up delivery of performance-assured home insulation and fabric upgrades, alongside clean heat. The goal is for everyone to get a comfortable, healthy home to live in, prioritising vulnerable people in sub-standard housing and those in fuel poverty or on low incomes who may be under-heating their homes.		
Wider policy benefits	Energy and carbon performance testing and related Outcomes-Based Guarantees help de-risk the electrification of heat, and secure verified energy demand reductions for the electricity grid, and emissions reductions for carbon budgets.	Heating cost-related Outcomes-Based Guarantees provide more robust protection for consumers against possible future energy price shocks, minimising the need for future emergency energy bill relief.	Comfort and health-related testing and Outcomes-Based Guarantees provide policymakers with assurances and confidence that vulnerable households have been permanently helped out of poor housing and unhealthy living conditions.

[10] See Box 16 in Section 4.2 for a description of the 'Affordability Equation'.
[11] See Home upgrade revolution as renters set for warmer homes and cheaper bills - GOV.UK (www.gov.uk)

3. Types of Outcomes-Based Guarantees already offered

3.1 Types of Outcomes-Based Guarantees

Outcomes-Based Guarantees are already beginning to be offered by the energy efficiency market, and relate to fabric performance, heat pump efficiency, comfort, and heating system affordability.

These guarantees help bolster consumer trust in energy efficiency and clean heat programmes, supporting the increased take-up of measures, enabling a lower-risk switch to clean heat, and helping to avoid the potential for nasty surprises in terms of home heating costs and performance.

A good example is a guarantee provided by Heat Geek, a network of heat pump experts. They provide their customers with a five-year performance guarantee, the Heat Geek Guarantee, that "your air source heat pump will achieve the overall efficiency quoted in your design." For example, if the heat pump system is designed to achieve an overall efficiency of 350%, then Heat Geek is guaranteeing that this outcome is achieved during the guarantee period. And if it is "not achieved", the team will "at no further cost to you, arrange to attend the property and conduct any remedial action necessary to upgrade the system performance of the air source heat pump to enable it to achieve the overall efficiency."[12]

We believe this is the first of its kind in the UK, and it matters because the better the actual efficiency of the heat pump, the greater the heat output for every unit of electricity used, and the lower people's heating bills will be.

The terms and conditions confirm that the heat pump's "overall efficiency" is measured over a period of 365 days using a monitoring system Heat Geek installs. The thermal envelope of the property must also be maintained in line with the heat loss calculations performed at the point of the heat pump installation.

Another helpful example of an Outcomes-Based Guarantee is by MIMA member Knauf Insulation's partner company Knauf Energy Solutions (KES). They guaranteed energy demand savings in kWh on a social housing retrofit project of 166 homes in Belgium. KES say they "offered a groundbreaking energy performance guarantee to the social housing company. In simple terms, if we didn't deliver the energy improvements, we would pay for the energy costs."

The performance guarantee offered was enabled by using KES's Smart Retrofit Metering Technology before and after renovation, to demonstrate the real energy performance improvements achieved. A guarantee was made of a minimum 25% improvement to each home's 'Energy Demand Indicator (EDI)'. In reality, an average improvement of 37% was realised, saving tenants an average of €1,000 a year.[13]

The EDI is a standardised measure of performance, similar to the Heat Transfer Coefficient (HTC). A 25% reduction means the homes will require 25% fewer kWh of energy for heating to reach set indoor comfort temperatures in an average weather year. Hence, it is a measure of a home's fabric efficiency in 'averaged' conditions. If, for example, a household sets the thermoset temperature higher than the average, or a winter is particularly cold, then heat demand will likely rise. And vice versa.

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[12] See Homeowner Agreement (heatgeek.com)
[13] See CaseStudies (All) | KES Site (knaufenergy.com)

The measurement approach allowed the desired 'outcome' of the retrofit to be 'contracted for' rather than the homeowner buying the 'installation of insulation measures', where the installation quality and in-use performance are assumed.

The project included cavity wall insulation, roof insulation, replacement of windows and doors, installation of a smart ventilation system, and replacement of boilers and radiators. Going forward similar guarantees for projects in the UK could be offered which include more and alternative types of insulation as well as clean heating systems as part of the package.

Outcomes-based requirements relating to heating system running costs and affordability could also drive more commercial guarantees in this area.

For instance, the Government's Warm Homes: Local Grant (LG), which delivers insulation and other measures such as solar panels, and low carbon heating in certain low-income households, has a primary objective to achieve energy bill savings from each project, and states specifically that "low carbon heating will be available to homes of all fuel types, but clear advice must be provided on bill impacts.[14]

The linked Warm Homes: Social Housing Fund (SHF) Wave 3,[15] which supports and encourages energy efficiency and clean heating upgrades in the social housing sector, has also set a requirement that applicants may propose low carbon heating installations in any eligible home, but that "bills must not increase as a net result of all retrofit works to the home, relative to what they would have otherwise been." Homes must also comply with other SHF performance outcomes. The guidance makes clear that "with the £20,000 grant funding [portion of the scheme], installation of a low carbon heating measure is mandatory in each home, and it is expected that energy efficiency measures (such as solar PV or insulation) are also installed to ensure bills do not go up in each home."

Hence the combination of measures is expected to deliver the outcome that "bills must not rise." MIMA also anticipates that the measuring and metering of fabric and heat pump performance, and the development of affordability-related Outcomes-Based Guarantees, will provide a robust demonstration of compliance with this important requirement. The SHF's support for the installation of Smart Meter Enabled Thermal Efficiency Ratings (SMETER) technologies[16] is therefore very welcome.

Box 5 | Minimising heat demand to reduce running costs

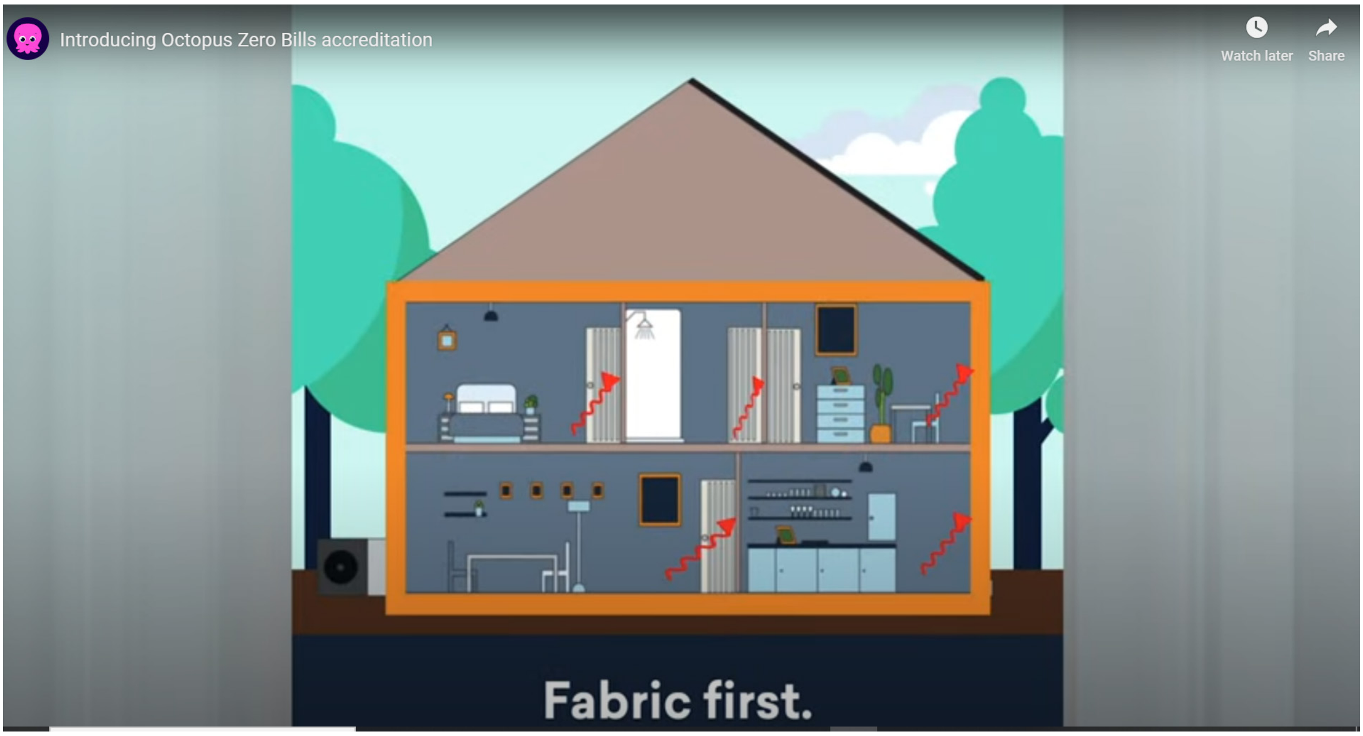
MIMA discusses the benefits of insulating first or at the same time as fitting a low carbon heating system in Box 12 in Section 4.1.2. It is preferable to minimise a home's heating demand as much as possible before or alongside fitting a new heating system, and especially for systems running on electricity as electricity unit prices are currently around four times the price of gas.

Another interesting offer by Octopus Energy is the 'Octopus Zero Bills' homes guarantee for new build housing. Their Zero Bills homes are very energy efficient properties with a combination of solar panels, batteries, and a heat pump, with guaranteed zero bills for five years. And importantly, this form of Outcomes-Based Guarantee has embedded a 'fabric first' approach.[17]

[14] See Warm Homes: Local Grant guidance
[15] See WH:SHF Wave 3 Scheme Guidance
[16] See Section 4.1
[17] See Making Zero Bill homes the new normal | Octopus Energy | Octopus Energy

At present the offer is targeted at new build homes, but Octopus says for existing homes "down the line, if homes meet our Zero spec – including battery storage, solar panels, and electric heating – we'll then use cutting-edge tech to optimise the household's consumption and energy export in exchange for a zero bill."

Figure 1 - Screenshot of Octopus' Zero Bills promotional video



In terms of comfort-related guarantees, British Gas offer their 'Warm Homes Promise'.[18] They "guarantee that your air source heat pump will heat your home to the temperatures agreed and included on your customer documentation for a period of 1 year from installation."

British Gas' Outcomes-Based Guarantee emphasises the importance of insulating, stating that they "reserve the right to…require you to upgrade your home and/or your insulation prior to installation or not to provide the Warm Home Promise in connection with an air source heat pump installation if we deem suitable temperatures are not achievable in your property or if you do not meet the required insulation or building standards for an air source heat pump to work effectively."

Again, the Guarantee is dependent on a monitoring system being in place, which can "include but is not limited to a heat meter, measuring radiator flow temperatures, electricity meters, temperature sensors and room thermostats". If the heating system does not reach the "right temperature," the engineers will "come to put things right – or give you your money back."[19]

These are just a handful of examples of Outcomes-Based Guarantees, and what is clear is that measuring, metering, and monitoring of performance, including the home's internal environment, plays a central, enabling role for such guarantees.

MIMA's vision is for such monitoring to become the norm so, in future, more consumers can benefit from a guarantee of a good outcome. Policies in the form of incentives and rewards for organisations who offer such testing, measuring, and monitoring, alongside excellent overall quality assurance will be needed in the short-term so that companies innovating in this way are not at a competitive disadvantage.

[18] See Terms-and-Conditions-Heat-Pumps-Warm-Home-Promise.pdf
[19] See Discover our eco-friendly air source heat pumps - British Gas

Recommendation 2: Government schemes to incentivise the measurement, metering, and monitoring of home fabric performance and clean heating systems, moving towards making this mandatory for government funded energy efficiency programmes.[20]

Detail: To support Retrofit Providers in bringing forward more measurement, metering, and monitoring of building energy performance in the short-term, and to make headway on MIMA's proposed 2030 Target, government should proactively incentivise checks of home fabric performance and clean heating systems, including by:

- Expanding 'pay for performance' policies such as that being consulted for ECO4.[21]
- Updating Energy Performance Certificates (EPCs) to include the capacity for assessors to input measured data collected on a building's fabric performance, and potentially other measures, to improve the accuracy of the EPC rating,[22] plus new metrics to drive such measurement, including an Actual Fabric Energy Efficiency (AFEE) rating.[23]
- Developing policies based on concepts which place a value on the energy we do not use,[24] in addition to policies we already have to increase energy supply, and particularly renewable energy.

The AFEE metric is a tool to support efforts to verify the actual energy performance of homes. EPCs already have several standard metrics providing information to the consumer about a property's possible running costs, energy performance, and emissions when used in a standardised way. Many EPCs now show the estimated space heating demand for properties based on calculations using the Standard Assessment Procedure (SAP).

MIMA has consistently recommended as part of on-going EPC reforms, not only that EPCs include an official metric relating to the fabric performance of dwellings, but also that the value shown on the EPC can be, and in time, is always based on the actual, measured performance of the fabric,[25] giving a more accurate assessment which we are calling an AFEE.[26]

MIMA is therefore extremely supportive of the Government's recent proposals[22] [27] to include a fabric performance metric on EPCs, and to drive fabric performance testing as part of EPC reform and 'pay for performance' in ECO4 and GBIS. The Government recognises that EPCs are now being used for a greater variety of purposes than was envisaged and that improvements are needed to make them more accurate and reliable, including incorporating the measured performance of buildings into the EPC process.

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20 Mandatory heat metering was also recommended by an industry collaboration in 2022, culminating in the 'Cheaper Bills, Warmer Homes' report FUTURE-FIT-REPORT.2022.pdf
21 See Energy Company Obligation 4 and the Great British Insulation Scheme: mid-scheme changes - GOV.UK
22 The government's current consultation on EPC Reform includes proposals on this topic. See Reforms to the Energy Performance of Buildings regime - GOV.UK
23 See below for a description of AFEE.
24 Sometimes referred to as 'Negawatts'. See Kickstarting_negawatts.pdf
25 Based on the whole-house Heat Transfer Coefficient (HTC) measured in use.
26 See more in see Knauf Energy Solutions on LinkedIn: 019578_207fdf523b8e43a99452fa9d81be86bc.pdf
27 See Energy Company Obligation 4 and the Great British Insulation Scheme: consultation on mid-scheme changes

Box 6 | Guaranteeing energy savings

"The best way to save energy is not to use it at all", *MIMA member Superglass, 2024*[28]

3.2 Why performance testing and Outcomes-Based Guarantees are useful

Verifying that the fabric of a home and its low carbon heating system are both performing well means customers and energy suppliers can be confident that buildings are not wasting energy and electricity consumption will be minimised.

However, not all retrofitted homes perform in line with the design – referred to as the 'performance gap'. Measuring, metering, and monitoring can reveal if there are issues, and is discussed in more detail in Section 4.1. This section summarises why buildings may not always perform as intended, some of the possible impacts, and how Outcomes-Based Guarantees can help address this.

3.2.1 Performance issues

Measures can sometimes under-perform once in use for many reasons with implications for a household's energy use, energy bills, emissions, comfort, health, and safety.

Fabric performance, like heat pumps, is highly sensitive to the quality of installation. Failure to use the right insulation in the right quantity, and not properly addressing gaps in the insulation layer and thermal bridges, can significantly reduce its performance.

For instance, if walls are fitted with insulation boards where gaps have not been properly sealed the wall may suffer from bypass effects resulting in the real heat loss from the property being worse than calculations predict, particularly in exposed windy locations.

Similarly, loft insulation performance may become compromised where those spaces are used to house equipment such as ventilation systems and inverters for PV, with maintenance of the kit requiring people to move around in the loft, potentially disturbing the insulation.

Insulation may also have been assumed to be present for an EPC, and counted as reducing the home's heat loss, but is missing in reality. Plus, energy models and energy efficiency policies[29] tend to assume perfect performance of energy efficiency improvement measures.

There is a substantial body of evidence covering new and existing homes from the former Zero Carbon Hub, Innovate UK, Leeds Beckett University, UCL, Oxford Brookes University, and the Building Performance Network demonstrating the existence of 'performance gaps' between the design fabric performance of homes and their in-use performance. The degree of the problem differs between properties, with some homes performing extremely well in practice, but the actual heat loss from buildings can be more than 50% worse than the design value.[30]

In terms of heat pumps, findings from the Government's Electrification of Heat demonstration project published in December 2024,[31] show that the median heat pump performance for the 742 homes taking part in the trial is around three times the efficiency of a gas boiler, at nearly

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[28] See Superglass The Walk Brand Film - Superglass Insulation Ltd
[29] For example, the Future Homes Standard Consultation proposes all new homes in England will be built with low carbon heating from 2025. The Impact Assessment acknowledges that 'performance gaps' exist but does not quantify this and therefore does not quantify the benefits of closing it. See Future Homes Standard consultation stage impact assessment
[30] For example, see Quantifying the domestic building fabric 'performance gap' - Leeds Beckett Repository
[31] See Box 18 and Electrification of Heat Demonstration Project"

300%. This is great progress and is better than results from previous field trials. However, the performance range found remains large.

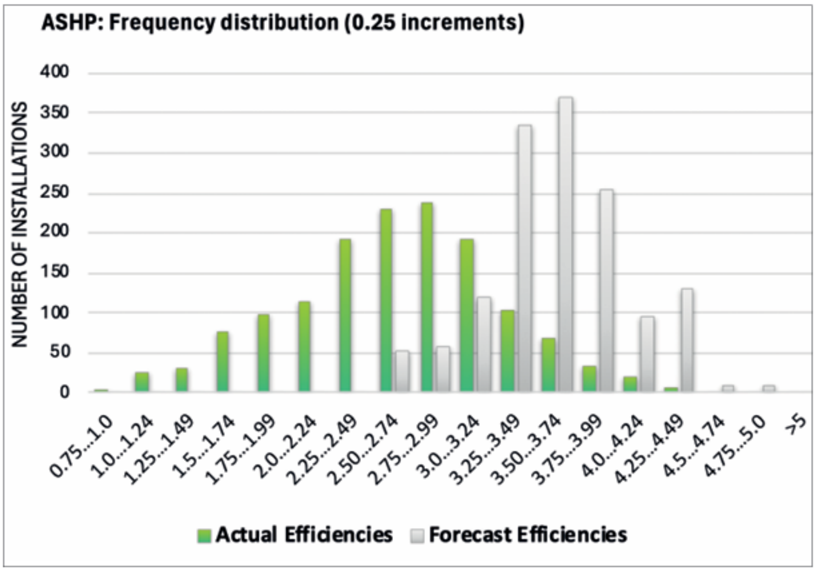
The authors of the report, the Energy Systems Catapult, also highlight issues with performance gaps, stating "whilst this study has found that for many homes, the real-world performance of heat pumps is good; it is clear when comparing the in-situ SPF_{H2} to "as designed" SCOP that there is a discrepancy between operational heat pump efficiencies and those provided at the design stage. For 91.9% of the properties considered, the SPF_{H2} was lower than the SCOP. The mean difference between the two was -0.66 meaning the median SPF_{H2} was 17.9% lower than the median SCOP."

They add that this "general overestimation of performance" suggests that "the methods for estimating 'as designed' SCOP might fail to predict whether a given heat pump installation will perform well compared to others."

New analysis of Ofgem's heat pump performance data for 1,700 installations under the former Renewable Heat Incentive[32] also finds a significant performance gap between the design efficiencies and in-situ values across both ASHPs and GSHPs. Again, the authors found that average heat pump efficiencies have improved overall since previous field trials, but that only around 30% of ASHPs were performing at SPF 3.0 or above. They also reported that "a significant performance gap between the design SCOPs and the in-situ efficiencies remains for both ASHPs and GSHPs and the gap appears to be widening for ASHPs."

The issue is illustrated well in Figure 2 taken from the report. It shows the spread of measured SPFs for 1,431 ASHPs and compares this to installer forecasted levels. The study found that "38% of ASHPs have in-situ SPFs of less than 2.5 while all installer forecasts were above 2.5."

Figure 2 - Frequency of ASHP in situ SPFs and installer forecast SCOPs



In the studies quoted in this section the existence of significant fabric and heat pump performance gaps was revealed by measurement and monitoring. Monitoring gives homeowners and Retrofit Providers valuable information about the performance of their property, allowing them to address any problems should they arise.

[32] See rbandm-research-project.pdf

4. Enabling and encouraging Outcomes-Based Guarantees

4.1 Measuring, metering, and monitoring

4.1.1 What do we mean by measuring, metering, and monitoring?

Fabric testing

The testing of building fabric and insulation performance is a growing market, in part enabled and supported by the Government's Smart Meter Enabled Thermal Efficiency Ratings (SMETER) programme.[33] This is evaluating technologies which use a home's smart meter data plus other information such as internal temperatures to measure a home's Heat Transfer Coefficient (HTC).[34]

There are a range of such SMETER-type technologies available, as well as other fabric testing approaches which measure whole-house heat loss. SMETERs do not require residents to leave the home, minimising disruption. This form of testing technology uses energy consumption data in combination with weather and other data to calculate how well the building fabric is performing. In general, the more information the evaluation algorithm incorporates, the more accurate the method will be at determining the actual HTC.

An alternative form of short duration testing option is to determine the HTC as measure of the heat flow through the building's envelope when a temperature difference exists between the inside and outside, and therefore is done when the building is vacant. A rapid result is possible in approximately 10 to 12 hours following heating of the property to achieve the temperature difference. This means the test works best in the winter months. Data on the heat loss is collected by multiple sensors and monitors and is then analysed by proprietary software to produce the measured HTC.

Whichever method is used, the measured HTC can then be converted into a space heating demand value for the property, plus the measured HTC can be compared with design predictions and can show if there is a difference between the expected and measured fabric performance of the building overall.

The Future Homes Hub's 2023 Building Performance Evaluation (BPE) Guide: Where to Start[35] provides a useful list of BPE providers, including case studies of providers of the newer, rapid fabric tests. The Guide stresses the importance for all measurement technologies and techniques to be properly validated and for results to come with information about the accuracy, precision and uncertainty of particular measurements. For the latter, a Confidence Interval may be quoted.

For instance, a technique which has a large confidence interval would not be able to detect the impact of a defect which is expected to only cause a very small reduction in the HTC.
Such issues can be mitigated by undertaking multiple measurements on a single home or single measurements across a number of similar homes and using the average. Ideally tests should be accurate enough to measure the impact of single fabric improvement measure, and the policy imperative should therefore be to drive-up accuracy in these types of measurement technologies.

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[33] See Technical evaluation of SMETER technologies (TEST) project
[34] The HTC is a fundamental measure of the thermal performance of the building envelope.
[35] See BPE Guide -18.10.23.pdf (cdn-website.com)

Government is beginning to adopt these tools in policy, and 'pay for performance' approaches could, along with accreditation,[36] incentivise increasing accuracy.

The tests range in price but start at the low £hundreds and are likely to aggregate around this price point or lower if the market is driven at scale.

Box 7 | Diagnosing the reasons for under-performance

With any of the tests above, if a significant discrepancy between the expected and actual heat loss is found, additional tests such as thermal imaging may be needed to find the cause and further work then carried out to rectify the issue.

The future testing framework should set out, as a minimum:

- The range of approved/accredited testing methods and technologies;
- Their likely cost and time periods needed for collecting data;
- What validation processes testing technologies have undergone;
- What level of performance gap is deemed acceptable;
- How to assess the cause of any gap uncovered; and
- What steps are needed to address any problems identified.

Test methods and tools need to be sufficiently reliable and forensic to accurately identify the cause of any potential shortfalls in building performance to avoid the potential for energy efficiency measures being incorrectly seen as under-performing if, in fact, it is due to other causes.

Heat metering and monitoring

Technologies enabling measurement of the coefficient of performance of heat pumps are also available. These measure the heat output and the electricity consumption of the heat pump over a period of time. The heat output is measured using a heat meter and the electricity consumption is measured using an electricity meter or sub-meter. The efficiency of the system is then calculated by dividing the heat output by the electricity consumption.

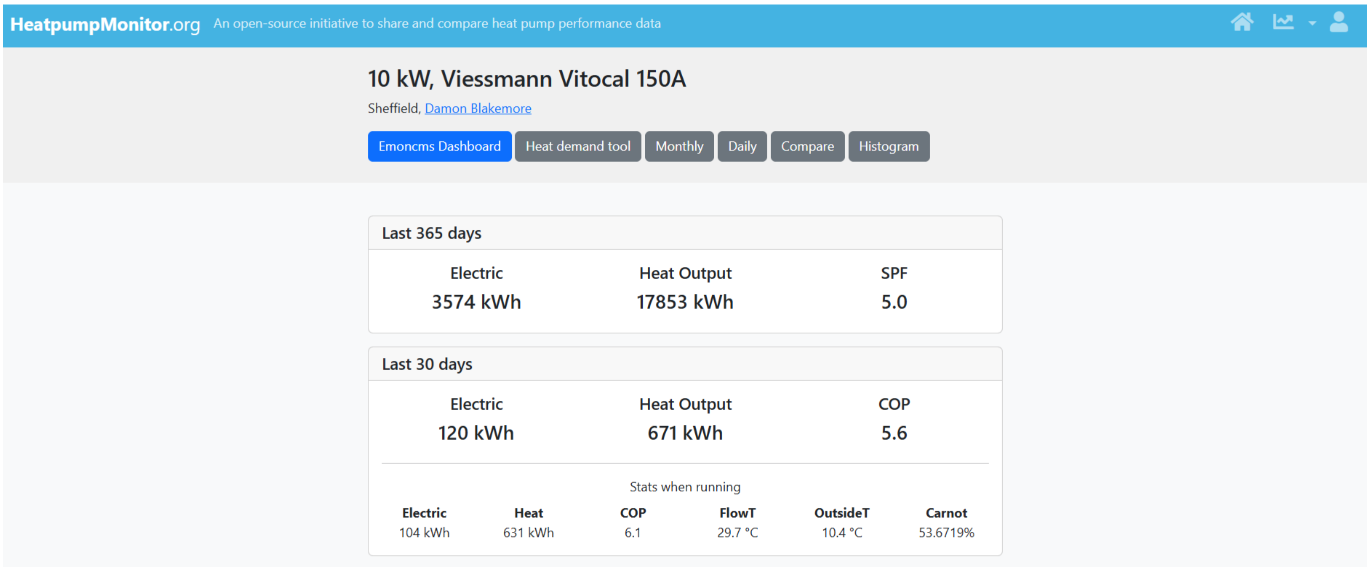
Certain companies offer services which allow the data about heat flows and electricity use to be downloaded and used to make graphs and other summaries to help consumers and their advisers understand and improve the heat pump system performance.

For instance, the HeatpumpMonitor.org website[37] is an excellent resource where heat pump users share their data, different monitoring set-ups, and advice and experiences of different heat meters.

In the example below,[38] an extremely high annual average heat pump efficiency is being achieved. The building is a 133m^2 detached property with "some insulation in the walls and loft." The detailed assessment of the space heating demand is 18,837 kWh per year. 16 radiators supply the heat, of which 50% were new.

[36] See Recommendation 3 and Energy Company Obligation 4 and the Great British Insulation Scheme: consultation on mid-scheme changes
[37] See HeatpumpMonitor.org
[38] Accessed 23 September 2024.

Figure 3 - Screenshot illustrating the type of information on HeatpumpMonitor.org



There is also a cost associated with incorporating heat meters into system design potentially in the region of several hundred pounds,[39] and heat metering is not currently required by Microgeneration Certification Scheme (MCS) standards[40] or the Boiler Upgrade Scheme.[41]

However, some heat pump systems come with monitoring as standard, and certain energy companies are offering monitoring services as part of their package. For example, E.ON Next offers monitoring of the system via their app for two years included in the cost, with a monthly remote check-in on the performance of the system, with any adjustments included.[42] Good Energy also offer "for every heat pump installation we complete we offer a remote monitoring service to customers so that we can spot any issues quickly, and often solve them without ever having to visit the property."[43]

It is also likely that heat meter costs will fall once they are being fitted at scale or if required to be installed during manufacture, allowing the investment to be more easily absorbed into heat pump projects budgets which currently have an average overall installation cost of around £13,000.[44]

Box 8 | Measuring heat pump performance

Measurement of the in-use seasonal coefficient of performance or seasonal performance factor of a heat pump is an indicator of efficiency. Broader BPE with data on the accompanying conditions such as the outside air or ground temperature, the temperature of hot water generated (domestic hot water and space heating), the on-off cycling etc. can provide a more nuanced picture for comparison back to the design.

[39] See Monitoring your heat pump's performance - Centre for Alternative Technology (cat.org.uk)
[40] However, we note that MIS 3005-I, the Heat Pump Installation Standard, states that heat pumps should be installed so that heat metering could be added at a future date with minimum cost or disruption. See MIS-3005-I-Heat-Pump-Installation-Issue-1.0.pdf
[41] Ofgem's BUS guidance for installers states that "Electricity and heat metering is not required for BUS but may be included as part of the system if desired." See Boiler Upgrade Scheme: Installer guidance V4
[42] See Air Source Heat Pumps | E.ON Next (eonnext.com)
[43] See How we know our heat pumps outperform others | Good Energy
[44] See Table 1.3 Boiler Upgrade Scheme statistics - GOV.UK

4.1.2 Why measure?

MIMA is advocating for the measurement of home energy performance using accredited technologies and methods, rather than relying solely on calculations or modelled estimates.

Recommendation 3: Government to set a framework for the accreditation of methods and technologies used for fabric testing and heat metering and require that accredited approaches are used by Retrofit Providers.

Detail: As a minimum, fabric performance testing and heat pump heat metering offered by Retrofit Providers to customers as part of a home upgrade in pursuit of the 2030 Target, must use accredited methods and technologies, as defined by the Government in consultation with industry, and which includes requirements relating to accuracy, referencing existing standards as appropriate.

As stated in Recommendation 2, we want to see fabric performance testing and heat pump heat metering offered to customers and quoted for as a standard part of the customer journey by Retrofit Providers, and for government policy and industry standards to encourage such offers to be made. But why?

In addition to assured comfort, installation quality, and verified energy and carbon savings, measuring performance enables:

- More accurate heat pump sizing; and
- Better estimates of heat pump running costs

Box 9 | De-risking the transition to clean heat

"As the way we heat buildings changes towards new technologies like heat pumps, it becomes more important to know whether the building fabric and heating systems perform as designed. For example, heat pumps could be unable to produce sufficient heat to overcome under-performing fabric, whereas high output boilers would be able to do this (albeit accompanied by high energy use)." *Future Homes Hub, 2023*[45]

[45] See BPE Guide -18.10.23.pdf (cdn-website.com)

More accurate heat pump sizing

When specifying a heat pump system, MCS accredited designers and installers are required to first perform a detailed room-by-room heat loss calculation by taking or using measurements of the dimensions of the property, estimating losses through the walls and other elements, and then matching the heat pump system output in kWs to the overall heat loss. As these heat loss estimates are based on default U-values and other assumptions, the result is unlikely to be the same as the measured performance of the building fabric and the associated space heating demand, even when the calculations are carried out to a high standard.

A heat pump system, including new or replacement radiators, installed on the back of calculated heat losses may therefore end up being incorrectly sized.

If the home's actual heat loss is much higher than the calculated value, the heat pump may be too 'small' – i.e. the heat output is not enough to replace the heat being lost – potentially creating comfort issues when using 'design' flow temperatures and assumed heating schedules. Householders may resort to boosting temperatures at peak times of the day.

Conversely, if a heat pump is oversized the upfront cost will likely be more than is necessary,[46] and if significantly oversized, may run less efficiently than it is supposed to, turning itself off and on more frequently than it is designed for.

For example, Ovo's heat pump guidance says "Bigger isn't always best when it comes to air source heat pumps. It's really important to find the right size. A heat pump that's too big and powerful for your home will frequently switch off and on. This can rack up high energy bills and the strain can eventually lead to faults. A heat pump that's not powerful enough on the other hand won't be as efficient. It'll need to run for longer and even then it might not be able to heat your home to a comfortable temperature. This could also lead to higher energy bills…"[47]

On sizing and oversizing the MCS advises that "sizing the heat pump correctly is of paramount importance. Various field trials seem to indicate that accurate sizing is important in order to maintain efficient running of the system…most ASHP, and increasingly, GSHPs have variable-speed inverter compressors. These generally adapt automatically to load demand, often improving efficiency at part load conditions. However, this ability should not be used as a reason for significant oversizing as cycling will occur at lower demand levels due to the limited inverter 'turn-down' available (typically 25%)."[48]

Hence, a certain amount of cycling can be acceptable, meaning deliberately oversizing a heat pump slightly may provide a partial solution to comfort concerns.

However, MIMA believes it is preferable for the consumer to be given the option to have their home's actual heat loss measured, including after they have had insulation fitted, to get the heat pump size right. This measured fabric performance should be maintained for 40+ years, also enabling future heat pump replacements every 15 to 20 years or so to benefit from correct sizing. This measured heat loss also shouldn't change if the building occupant's change or if their energy use patterns change as it is a measure of the how well the building envelope itself retains heat.

[46] See Section 4.2.
[47] See What size air source heat pump does my home need? | OVO
[48] See Heat-Pump-Guide.pdf (mcscertified.com)

Box 10 | Fabric testing for accurate heat pump sizing

The need for routine building performance monitoring is one of the recommendations of a detailed report published in 2022 by the Energy Futures Lab at Imperial College.[49] The study looked at many important aspects of BPE and at the results of the Government's SMETER programme, including methods for assessing home heat loss with a view to improving the sizing of emitters and heat pumps.

They state that "pre-installation measurement-based assessment of building performance would provide more accurate heat loss data for heating system design (including HP sizing) and forecasts of HP performance and costs given to the consumer," and recommend that the Government introduces "a requirement that all new heat pump installations carry out measurement-based assessment of the actual in-situ performance of the building and heat pump system."

Fabric testing therefore gives a truer reflection of a home's heating demand for heat pump sizing, but what if the heat demand is high or very high for the building type in question?

In this scenario MIMA recommends that the homeowner is advised to upgrade the fabric of their building, with wall (cavity or solid) and loft insulation installed where appropriate,[50] plus more efficient glazing, and draughtproofing. As these measures reduce the amount of energy needed to heat the property, it may be possible for a smaller heat pump to be specified.

Recommendation 4: Retrofit Providers should fit the smallest heat pump system possible, enabled by measuring the home's actual heat loss and improving the building fabric where appropriate.

Detail: Industry standards should seek to ensure that Retrofit Providers are specifying the smallest heat pump system possible to achieve desired internal temperatures, in order to potentially reduce up-front and running costs for the consumer. This goal is enabled by improving the building fabric, where appropriate, especially if the home's heat loss is high, and by measuring the fabric's actual performance.

Relevant industry standards should require Retrofit Providers to record for a household what steps will be taken to reduce the size of their heat pump system, including insulating.

Again, guidance by Ovo suggests that well insulated homes are "more suited to smaller heat pumps that are cheaper to buy – and run.[51] Heat Pumps UK also suggests that a "well-insulated" three-bed property may require a 5 kW air source heat pump, whereas a "poorly insulated" one could require a 7.5 kW system. The guidance states "to minimise your costs you should look to insulate your property to the best level possible first to avoid having to oversize your heat pump."[52]

[49] See Accelerating the transition to heat pumps | Energy Futures Lab | Imperial College London
[50] See Recommendation 6.
[51] See How efficient are heat pumps? What do SCOP and COP mean? | OVO
[52] See What Size Air Source Heat Pump Do I Need For My Home? | Heat Pumps UK

The difference in up-front cost between a small, say, 5 kW heat pump system, and a large one could run into the £1,000s,[53] meaning fitting a smaller system would partially or fully off-set the cost of installing insulation measures such as loft or cavity wall insulation. Better insulation may also mean fewer radiator replacements are needed, also reducing the cost of the heat pump project overall.

The average radiator replacement cost in the Electrification of Heat trial was £2,800 ± £900, with the average cost per radiator at £300, and the average cavity wall insulation cost £800 ± £100.[54] The combined cost reduction of needing fewer radiator replacements, alongside a smaller heat pump, enabled by better, accurately measured fabric performance, could be sizeable and more than the cost of installation of basic insulation measures.

Box 11 | Can basic insulation pay for itself with a smaller heat pump system?

"If you have low-cost insulation measures that can be implemented then these are a sensible first step in a full retrofit, including to EnerPHit, in part because this sometimes removes the need to upgrade radiators. With cavity wall insulation costs for a modest house around £1k, this could pay for itself in unneeded new radiators and a smaller heat pump." *Passivhaus Trust, 2024*[55]

Box 12 | Ordering of fabric measures and heat pumps

It is widely recognised that the deployment of low carbon heating systems, such as heat pumps, needs to ramp-up significantly and fast so the UK can get on track to meet emissions reduction targets. Fortunately, statistics from the Boiler Upgrade Scheme for 2024[56] suggest the numbers are going in the right direction, though the rate of installation still needs to rise substantially to meet the Government's target for 600,000 heat pumps installed per year by 2028.

This urgency does not mean we can afford to reduce ambition on getting homes insulated; especially as insulating can support the affordability and success of heat electrification. Also, heat decarbonisation is not the only goal. We need Net Zero homes to be low energy, have low running costs, and be comfortable, healthy, and safe to live in.

Hence, while insulating may not be a technical pre-requisite for a heat pump to 'work' in a home,[57] there are many good reasons to insulate where this is appropriate, when fitting any new heating system, and as stated above, particularly before heat pump sizing.

Consumers get the best outcome for the long-term when fabric measures and low carbon heating work together. The Passivhaus Trust put this well:"It is clear that the facts have changed and to reduce carbon emissions from heating as quickly as possible, the best time to install a heat pump is immediately. But this strategy doesn't address health, comfort or affordability. For these, you need fabric and ventilation improvements as well…Enabling heat pumps and fabric to work in synergy to maximum effect is the "people first" choice - it will deliver not only CO2 emission reductions but also running cost savings, comfort, and health…"[58]

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53 For example, see Air Source Heat Pump Costs in the UK: 2024 Guide
54 See BEIS Electrification of Heat. Cavity wall insulation installation costs may be higher now, for example, the Great British Insulation Scheme assumes a cost of £1,750 for a semi-detached property.
55 See The Right Time for Heat Pumps | Passivhaus Trust | April 2024
56 See Boiler Upgrade Scheme statistics - GOV.UK
57 For example, see Factcheck: 18 misleading myths about heat pumps - Carbon Brief
58 See Guidance (passivhaustrust.org.uk)

UCL also looked at the need for 'envelope measures' when exploring scenarios for getting the London Borough of Islington's social housing stock to Net Zero.[59] The paper ultimately concluded that "the widespread deployment of heat pumps without some level of fabric retrofit would have significant implications for the capacity of the electricity distribution system[60] and—depending on the relative fuel prices of electricity and gas—on household bills and related factors including fuel poverty." This led to all five of the main scenarios including fabric measures, plus a range of other measures such as heat pumps and solar PV, with the exception of the 'do nothing' scenario.

In MIMA's view, the reasons for embedding a 'fabric first' approach to retrofit still stand within the context of the electrification of heat and should remain a core principle of policymaking. However, this does not mean we must wait to 'insulate all homes for the next 10 years', delaying heat pump roll-out. Nor does it mean 100% fabric first. Some homes will not be suited to insulation, and for others that are very 'hard to treat', the costs may be much too high.

We believe a pragmatic policy approach to joining-up fabric and heating upgrades in the short-term is therefore to first target low carbon heat deployment in the many millions of UK homes that already have reasonable or good levels of insulation.[61] Indeed, we believe certain energy suppliers are already doing something similar, for example, Ovo's specialised Heat Pump Plus Tariff offers eligible customers a reduced tariff for the electricity consumed by their heat pump up to an annual limit of 6,000 kWh. Anything above the limit would be charged at the standard rate.[62]

This approach builds on Nesta's proposed policy plan for heat decarbonisation.[63] It gets heat pumps into homes now, while providing time for electricity grid reinforcement and for funded upgrades to the fabric of homes for people living in fuel poverty or on very low incomes over the next five years. It also buys time to get new schemes off the ground to incentivise so-called 'able to pay' homeowners to insulate and switch to clean heat over the next decade, at minimal cost to the Exchequer.

It remains the case that for any heating system, an uninsulated home will use significantly more energy to heat it to a comfortable temperature than an insulated one, and for those using electricity every unnecessary unit consumed comes at a high price.[64] Reducing home heat loss as much as possible first through quality assured fabric upgrades therefore remains a sensible strategy, especially for properties where government funding is available to cover the upfront cost of the works, and there is time to secure that funding.

BSI's PAS 2035:2023[65] reinforces this principle, as do other organisations: "The existing building fabric should be as energy efficient as possible before spending resources on other measures. Subsequently, because insulation measures are generally among the most cost-effective and long lasting, and thus the best investment, insulation is usually the most appropriate next step. Insulating the fabric first also reduces the required capacity and cost of the heating system. The heating system usually has a shorter life than the improved building fabric (typically 15 years compared with possibly 60 years), so a dwelling might have four heating systems during the life of the installed insulation."

"It is the SEA's view that a fabric-first approach should sit alongside technology agnosticism. Considering the energy efficiency of a building's fabric first, and alongside wider Low Carbon Technologies (LCTs), should be a priority, as the Government have committed to doing.

[59] See Getting to net zero: Islington's social housing stock (ucl.ac.uk)
[60] This important theme is discussed in detail in Section 5.1.
[61] See Box 21 for further background on possible appropriate insulation levels.
[62] See Heat Pump Plus tariff add-on | OVO (ovoenergy.com)
[63] See Delivering clean heat - a policy plan (nesta.org.uk)
[64] See Section 4.2.
[65] See pas_2035_2023.pdf (bsigroup.com)

This is critical, as it places the emphasis on improving the quality of the UK's housing stock, delivering healthy buildings that promote wellbeing, minimising energy demands, increasing energy security, and many wider benefits, before or alongside the benefits attributable to using LCTs." *Sustainable Energy Association, 2024*[66]

"The first priority, whatever zero emissions heating systems is used, must be adequate energy efficiency to increase comfort and cut fuel bills by reducing the amount of energy needed to heat the home. Fabric first is at the forefront of the Scottish Government's approach and this is welcome for a number of reasons:

- Improved fabric efficiency reduces the size of heating system needed, reducing investment costs and ongoing costs.
- It guards against fuel poverty, protecting households from volatile energy prices.
- It allows homes to retain heat for longer, increasing comfort and resilience in the case of power outages or emergencies, and allowing electric heating schedules to be moved to off-peak times.
- It enables heat to be delivered through lower flow temperatures in wet heat distribution systems, making heating systems more efficient.
- It reduces the overall heat demand from homes, reducing the new load to be electrified, thereby reducing the burden and amount of investment needed in the grid." *Existing Homes Alliance Scotland, 2023*[67]

Better estimates of performance and running costs

It is good practice for heat pump installers to give their customers an estimate of the running costs of the system so they can understand what their future energy bills might be.

For example, MCS standards require installers to provide consumers with a "heat pump system performance estimate"[68] which is an estimate of performance before the installation goes ahead to ensure customers can make an informed choice.

In addition, the Government confirmed in its recent response to the consultation on the Boiler Upgrade Scheme that it will require landlords to "confirm that they have provided information to tenants on the implications of installing a BUS funded heat pump on their subsequent energy bills. Heat pumps installed in poorly insulated properties could result in bill increases and therefore it is imperative that tenants are consulted."[69]

Even with a perfect design in place, if measures under-perform once installed, heating bills will be higher than predicted and certainly higher than necessary. Measuring the actual fabric performance of a home makes it possible to give customers a much more reliable estimate of their future heating costs, and once a heat pump is installed, monitoring coefficients of performance can give an even clearer picture.

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[66] See Policy-Barriers-and-Solutions-for-a-Technology-Agnostic-Approach-to-Heat-and-Buildings-1.pdf
[67] See Heating our Homes - Knowing the Destination
[68] See MIS-3005-I-Heat-Pump-Installation-Issue-1.0.pdf (mcscertified.com)
[69] See Boiler Upgrade Scheme Regulations consultation: government response (publishing.service.gov.uk)

Box 13 | Illustration of the effect of 'performance gaps' on home heating costs

Gaps in fabric and/or heat pump performance can have a significant impact on space heating costs, even when the gap is relatively modest. Concerningly, the effect could cause heating costs to rise when switching to from an average-efficiency gas boiler to a heat pump, even if design calculations suggest otherwise, and despite the comparatively high efficiency of the heat pump.

Scenario 1 – No performance gap

- Reasonably good fabric performance - measured space heating demand matches the design level at 10,800 kWh per year
- Above-average heat pump efficiency - monitoring confirms the SPF is in line with the estimated performance of 3.5
- Outcome - annual space heating costs fall to £36 lower than when on gas

Scenario 2 – Performance gap exists

- Reduced fabric performance - measured space heating demand is 20% higher than the design/predicted level in Scenario 1 at 12,960 kWh per year
- Reduced heat pump efficiency - monitoring confirms the SPF is 2.8, 20% worse than the design level in Scenario 1
- Outcome – annual space heating costs rise to £188 higher than when on gas[70]

Assumptions: A 90m^2 semi-detached cavity wall property with a predicted space heating demand of 120 kWh/m^2/yr. The household switches from a gas boiler with an average efficiency of 85.3% to an ASHP. Gas costs 6.34p per kWh and electricity costs 24.86p per kWh, January 2025 Ofgem 'cost cap' unit prices.[71] Calculations cover space heating costs only.

[70] Targeted action to reduce electricity bills compared to gas may help with this type of imbalance, such as removing gas meters where possible and shifting policy costs for environmental schemes into general taxation (though the 'cost' still exists). However, fundamentally, for a given unit price, every time a performance gap exists, heating bills will be higher than predicted.
[71] See Energy price cap | Ofgem See Section 4.2 for discussion on unit prices and specialised heat pump tariffs.

Data from a small study carried out by MIMA member Knauf Insulation's partner company Knauf Energy Solutions (KES)[72] also provides an example of the possible impacts of performance gaps.

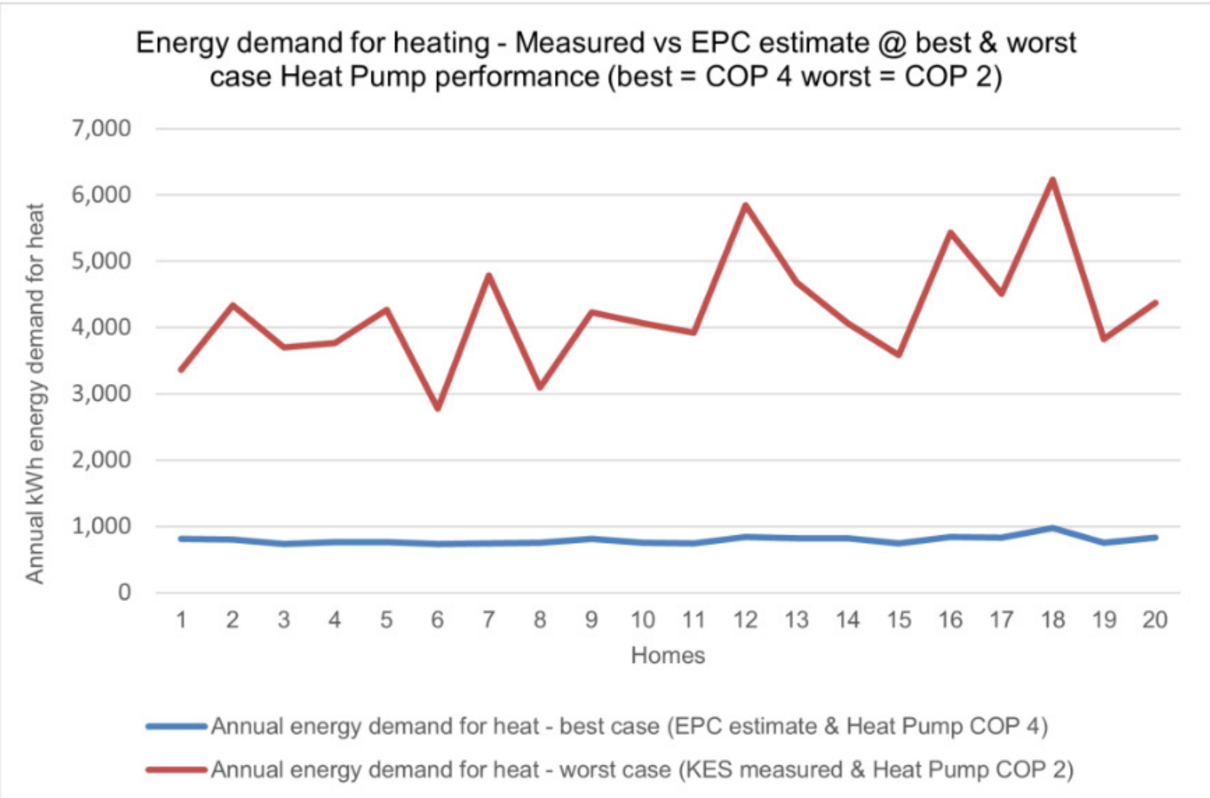
Twenty occupied, relatively new homes in Northern England were predicted on the EPC to have a space heating demand level of around 3,000 kWh per year to keep the home at a given temperature under standard occupancy. The measured space heating demand was much higher for all the properties, with the worst home having a heat demand of around 12,000 kWh per year, four times the predicted level. The average measured result was 2.6 times higher than the estimated level. Common build errors seen in many projects were present in these homes, including poorly installed loft insulation.

As a thought experiment, the team analysed two scenarios: the best and worst-case scenario if fitting a heat pump in these properties:[73]

1) Best case: A heat pump is installed with an excellent, above average seasonal coefficient of performance of 4. The estimated annual space heating demand on the EPC of 3,000 kWh per year is realised.[74] In this scenario annual heating costs would be just over £200, i.e. very low.

2) Worst case: The heat pump is installed and is found to have a very low coefficient of performance of 2, the bottom end of the range found in the Government's Electrification of Heat trial.[75] The actual annual space heating demand is 12,000 kWh per year. In this scenario annual heating costs would be around £1,800, a massive difference of £1,600 from the first scenario.

Figure 4 - Energy consumed for heating at a high and very low coefficient of performance



[72] See 'Low-energy' new homes – the cost of getting them wrong!
[73] Both scenarios assume the electricity unit price is 29.3p per kWh.
[74] This level of heating demand is what would be expected for a new build property and would not be representative of most existing homes, except those benefitting from a very deep retrofit.
[75] See Box 18.

Clearly in this example, predicting heat pump running costs using the design values and EPC estimates would be way off the reality, and even more so than would have been the case when heating with gas at cheaper unit prices. Measurement of actual performance would give the homeowners a more reliable estimate of costs and also reveal which elements of their home are working well and which are not so any issues can be addressed. During this project KES installed measures in the test homes to raise their energy performance.

In summary, we do not believe that policy frameworks and industry standards should leave homeowners to carry the risk of a poor outcome. Measurement, metering, and monitoring of fabric and heating system performance should be driven by policy and industry guidance as a standard part of making a home 'heat pump ready', along with other measures intended to support improved system efficiency such as radiator replacements.

Many early adopters of heat pumps have heat meters fitted to enable monitoring of their performance allowing checks that the performance matches the design.[76] Measurement allows homeowners to fine-tune performance to achieve better results if it is found to be lower than expected.

4.2 Securing affordability

Switching to an electric heat pump often means savings for consumers on their energy bills, especially when the home is insulated, and the homeowner adopts a specialised, reduced heat pump tariff, and/or the gas meter is removed.

For instance, a homeowner installing a heat pump in place of an old oil boiler, direct electric heating, or an old, inefficient gas boiler, should make a good saving on their overall energy bill, even at default electricity prices.

However, when the difference between electricity and gas prices is large, overall bill savings may not be realised when switching from a reasonably efficient gas boiler - which the majority of UK households use. In this scenario, the Energy Saving Trust estimates that energy bills could rise slightly. See Figure 5 below.[77]

Box 14 | Do heat pumps save money?

Guidance on DESNZ's website states: "Based on current energy prices, heat pumps can save a typical gas household around £234 per year when they opt for smart electricity tariffs and remove the gas meter. Actual savings can vary depending on how efficiently the heat pump operates. Modern, well optimised heat pumps perform well at higher temperatures, but households may wish to consider cost effective insulation and some radiator swaps to reduce running costs further." *Warmur, for DESNZ's Heat Pumps Explained, 2024*[78]

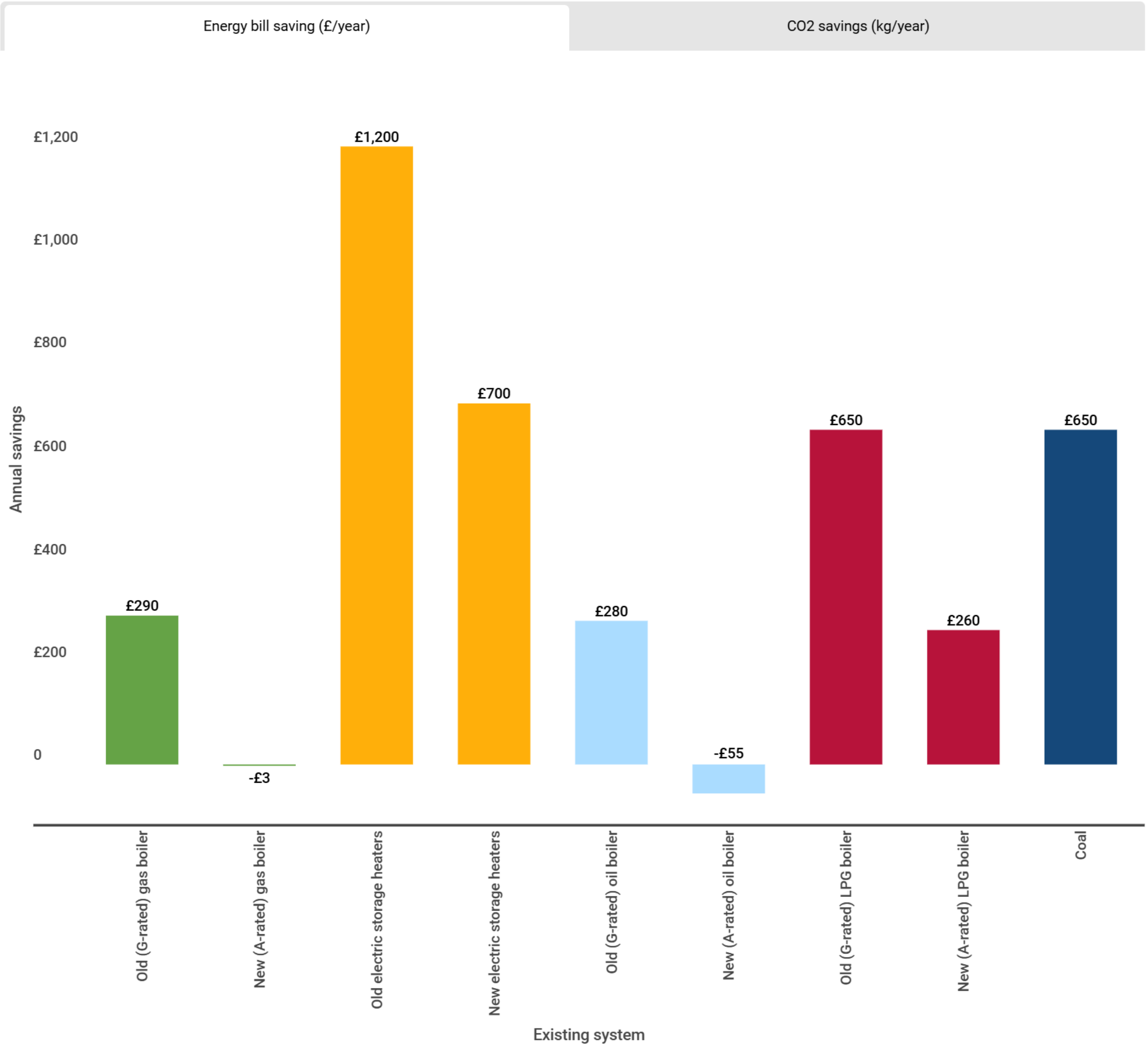
The bill saving given above is based on calculations by Octopus Energy. These assume total space and water heating demand is 10,207 kWh per year, i.e. a good level of energy performance for an average-sized house. The calculation also assumes the household is on a specialised heat pump tariff and that the gas meter has been removed, presumably reducing standing charges.

[76] See HeatpumpMonitor.org
[77] See Air source heat pumps - Energy Saving Trust. Analysis by the Regulatory Assistance Project (RAP) suggests that when heat pump coefficients of performance reach 3.1 or higher, a household's energy bills should start falling relative to gas (depending on relative unit prices). See Analysis: Running costs of heat pumps versus gas boilers
[78] See Heat pumps explained: experts answer your questions - GOV.UK (www.gov.uk)

Figure 5 - Energy bill savings estimated by the Energy Saving Trust by heating system type replaced

England, Scotland and Wales

Potential annual savings of installing a standard air source heat pump in a three bedroom semi-bedroom detached home, with radiator upgrades as required.



Getting people's energy bills down is a priority for the Government, as set out in the Warm Homes Plan, especially for fuel poor and low-income households, and policies are needed to deliver this. Insulating homes and the measurement of building performance must play its part.

Box 15 | The government's goal to make homes cheaper to heat

The Labour Government will "Jumpstart the national Warm Homes Plan Britain urgently needs, working in partnership with business, local government and the third sector to insulate homes and make them warmer and cheaper to heat." *Labour Party Manifesto, 2024*[79]

Heating costs are determined by three components: how much actual energy is needed to heat a home to a specified internal temperature (demand), the measured heating system and water efficiency (determining consumption), and the unit price of the energy used. These components are related by the equation in Box 16 which we call the 'Affordability Equation'. The energy used for heating the home – the space and water - is traditionally the largest component of energy bills.

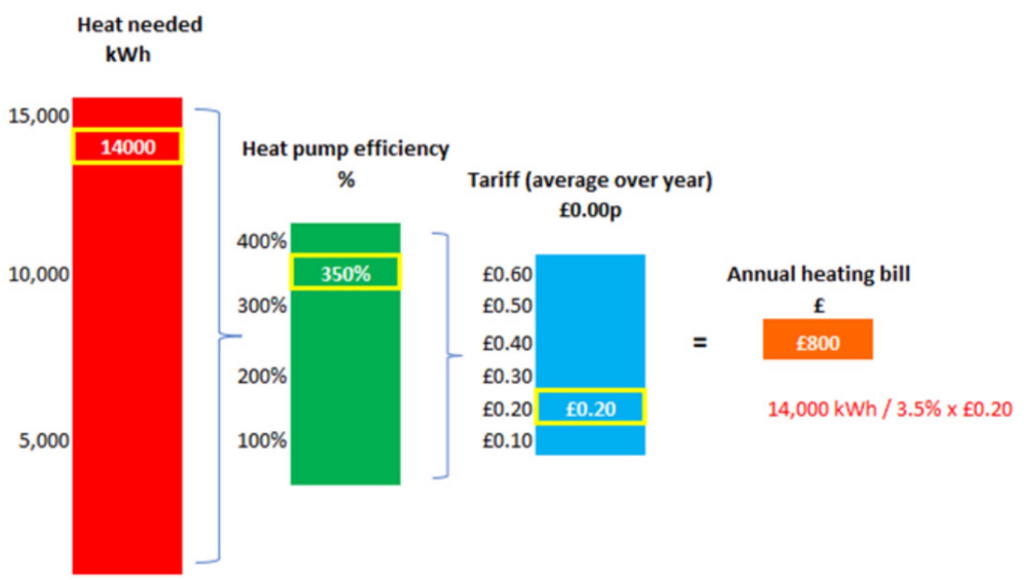
Box 16 | The 'Affordability Equation'

The Equation has three components: how many kWhs of heat does a home need to achieve comfortable internal temperatures, how efficiently does the heating system convert energy (gas or electricity) into heat, and what tariff is paid per unit of energy.[80]

Figure 6 - Example of the Affordability Equation

Annual heating bill

$$\frac{\text{heat demand (kWh)}}{\text{heating system efficiency (\%)}} \times \text{Tariff (£)} = \textbf{Space heating bill (£)}$$



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[79] See Make-Britain-a-Clean-Energy-Superpower (labour.org.uk)
[80] See A ROBUST WARM HOMES PLAN THAT CUTS BILLS – A ROADMAP FOR A NEW GOVERNMENT.

Whatever the level of energy unit price, space heating costs will be higher than necessary if either the heating demand is high due to poor insulation and fabric, or the heating system efficiency is lower than designed. Action on these two elements of the Affordability Equation are particularly important as the fabric performance of the building and the efficiency of the heating system are fixed parts of the property – fixed 'assets' – and will have a positive impact on energy use and fuel bills for decades.

Scenario 1
High heating costs

- Fabric – Poor. Measured space heating demand is 15,000 kWh per year
- Heat pump system efficiency - below-average. Monitoring confirms the SPF is 2.8[81]
- Unit price - electricity costs are 24.86p per kWh
- Outcome – annual space heating costs alone are £1,332

Scenario 2
Reduced heating costs

- Fabric – Improved. Measured space heating demand is now 10,800 kWh per year
- Heating pump system efficiency - average. Monitoring confirms the SPF is 3.0
- Unit price - electricity costs are 24.86p per kWh
- Outcome – annual space heating costs are £895 (£437 less than Scenario 1)

Scenario 3
Low heating costs

- Fabric – Improved. Measured space heating demand is 10,800 kWh per year
- Heating pump system efficiency - above-average. Monitoring confirms the SPF is 3.5
- Unit price – reduced. Electricity costs are 17p per kWh, a specialised heat pump tariff
- Outcome – By combining solutions annual space heating costs are £525 (£807 less than Scenario 1)

Assumptions: A 90m2 semi-detached cavity wall property. Scenarios 2 and 3 are improved to achieve a space heating demand of 120 kWh/m^2/yr. January 2025 Ofgem 'cost cap' electricity unit prices.[82] Calculations cover space heating costs only. No performance gap.

Box 17 | Consumer insights on running costs

"The running costs of a heat pump are a primary concern for four in five households when choosing a heating system, with over a third (35%) saying running costs were more important than the initial costs." *Research by Ovo, 2024*[83]

To permanently lower people's energy bills as we transition to clean heat, insulating a poor performing home where appropriate is very important, as well as increasing heat pump average coefficients of performance and lowering electricity costs for good. Policy action on all three elements in tandem de-risks delivery and takes the pressure of any one element to solve affordability issues.

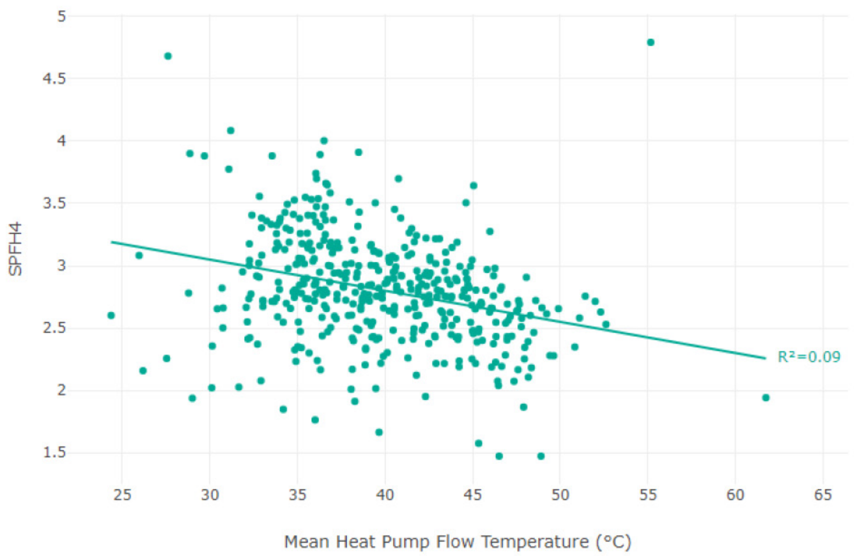
[81] The minimum required by the BUS.
[82] See Energy price cap | Ofgem
[83] See https://company.ovo.com/cheaper-than-a-gas-boiler-ovo-launches-best-in-market-heat-pump-offer/

Box 18 | Insulation's role in supporting high heat pump performance

An insulated home which retains heat well will better support occupant comfort at the low flow temperatures heat pumps need to operate at to be highly efficient.

In general, the lower the flow temperature and the smaller the difference between internal and external temperatures, the better the seasonal performance will be, resulting in less energy being consumed and lower heating bills.

Figure 7 - Relationship between heat pump performance and flow temperatures[84]



Ofgem continues to stress the link between insulation and heat pump performance in their Installer Guidance for the Boiler Upgrade Scheme following the policy decision to remove mandatory insulation requirements under the Scheme:

"It is important that property owners understand that heat pumps perform best in a well-insulated property. Insulation measures, such as cavity wall and loft insulation, are relatively low-cost measures that could reduce energy bills and increase heat retention in property. For example, without loft insulation, around a quarter of heat is lost through the roof. These types of insulation help to keep heat inside the home, making it more comfortable and lowering heating costs."[85]

British Gas and other energy suppliers emphasise the same point: "The better the insulation, the less heat your home will lose – and the less energy will be needed to operate the heat pump. A heat pump in a well-insulated home should be cheaper to run than a traditional gas boiler."[86]

With regard to unit prices, the third element of the 'Affordability Equation', it is great to see many UK energy suppliers now offering specialised tariffs for households with a heat pump, at significantly lower rates than the Ofgem cost cap default levels. These tariffs are either a flat reduced rate, such as British Gas' Heat Pump Energy Offer,[87] or 'time of use tariffs', with cheap electricity rates at certain non-peak times of the day. For example, Octopus Energy's Cosy Tariff,[88] Scottish Power's Heat Pump Saver,[89] and EDF's Heat Pump Tracker tariff.[90]

[84] See Electrification of Heat Demonstration Project
[85] See Boiler Upgrade Scheme installer guidance (ofgem.gov.uk)
[86] See Discover our eco-friendly air source heat pumps - British Gas
[87] See Discover our eco-friendly air source heat pumps - British Gas
[88] See Cosy Octopus | Octopus Energy
[89] See Power your heat pump for less | Heat pump tariff from ScottishPower
[90] See Save with EDF's Heat Pump Tariff | EDF (edfenergy.com)

Taking up such tariffs when switching from a gas boiler to an electric heat pump can mean heating bills fall significantly, because the lower electricity costs means the difference between electricity and gas unit prices – sometimes called the 'spark gap' - is greatly reduced.[91]

Reducing default electricity unit prices is also an important part of managing affordability concerns and supporting the uptake of clean heating systems. It involves the Government working to lower and stabilise electricity unit prices over time, as well as customers being offered specialised heat pump tariffs in the short term.

However, policies aimed at reducing electricity unit prices and costs are much needed, but cannot be the sole answer on affordability as the future state of the energy market is always an unknown. Similarly, over-reliance on specialised electricity tariffs could also carry risk because, as market offerings, their availability and nature will naturally fluctuate, and their continuation beyond contractual periods cannot be assumed should wholesale prices rise again significantly, making cheaper deals more difficult to sustain.

It can also be the case that individual market offerings have qualifying criteria, as would be expected. For example, criteria relating to who, or how many people can access a given tariff. Another important consideration is also whether consumers are in a practical position to opt for time of use tariffs. Well-performing building fabric has a role to play here too, helping households maintain comfort when pre-heating at cheaper times of the day, including within a 'long and low' heating schedule.

Box 19 | Enabling flexibility in heating schedules

"In well-insulated buildings, switching off a heat pump for several hours can have little impact on indoor temperatures. The benefits of more efficient building envelopes for system flexibility are demonstrated by the work of the IEA Energy in Buildings and Communities Programme. Yet most buildings, even in advanced economies, are poorly insulated, limiting the potential for heat pumps to play a role in demand-side flexibility." *IEA, 2024*[92]

We are seeing some impressive heat pump case studies with experts achieving substantial cuts in their energy bills and emissions with flexible or time of use tariffs. For example, one heat pump user halved their energy bill after fitting a heat pump, achieving an excellent seasonal coefficient of performance (potentially 4.5 from monitoring results), and signing up to Octopus' Agile tariff, alongside writing their own code to make the system pre-heat before peak hours.[93]

The case study notes that "all this has worked very well, and with the boost, even on cold days, the temperature in my front room rarely drops below 19°C…on a day when temperatures were around freezing, the room temperature dropped to 19°C. Clearly that's a function of how well insulated and draft-proofed your house is, but perhaps shows that there is additional value to be had from better insulation over and above simply reducing the thermal input needed to maintain a comfortable temperature."[94]

Not everyone will have this level of heat pump-control mastery, and so it is helpful to see that DESNZ is consulting on requiring electric heating system 'time of use operations' to be enabled by default, and heating schedules pre-set to operate outside of peak times, going some way towards replicating the sophisticated programming experts are carrying out.[95]

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[91] For example, see Impact of Heat Pumps and Time-of-Use Tariff on Energy Demand
[92] See The Future of Heat Pumps (iea.blob.core.windows.net)
[93] See https://www.linkedin.com/posts/rachel-a-lee_in-january-i-posted-an-article-see-link-activity-7198387364082106368-ez4A?utm_source=share&utm_medium=member_desktop
[94] See (26) Running my heat pump for half the cost of a gas boiler… | LinkedIn
[95] See Smart Secure Electricity Systems Programme: Energy Smart Appliances (publishing.service.gov.uk)

In summary, insulated homes with reduced heat loss will stay warmer for longer, enabling greater flexibility in heating schedules without users resorting to boosting temperatures too often and causing the heat pump's efficiency to drop.

Box 20 | Poorly insulated buildings can lose heat fast

Home energy performance in the UK has improved significantly in the last 20 years, yet even so, research in 2020 found that "a UK home with an indoor temperature of 20°C and an outside temperature of 0°C loses on average 3°C after five hours", three times faster on average than German properties.[96]

In conclusion and to stress, MIMA strongly believes that policy action on each of the three elements of the 'Affordability Equation', in tandem, will give the best outcome for consumers in terms of reduced energy use, reduced bills, and where low carbon heating systems are used, greatly reduced emissions. On top of policies to reduce energy prices, energy demand reductions through insulation and energy consumption reductions through ever-improving heat pump efficiency, must also do some of the heavy lifting.

Recommendation 5: The Warm Homes Plan should target all three determinants of space heating costs together: heat demand, space heating system efficiency, and energy unit prices, to reliably and permanently reduce energy bills.

Detail: The Government can drive down home heating costs for all, for good, by acting on all three determinants of heating costs in tandem: heat demand, heating system efficiency, and energy unit prices.

It is essential not to rule out action on any element of the Affordability Equation.
This means:

- Upgrading building fabric where appropriate to significantly reduce heat demand and measuring the actual heating demand achieved. Insulating homes also allows 'wriggle room' for energy prices to rise slightly if they need to, without energy bills skyrocketing.
- Installing low carbon heating systems such as heat pumps in suitable homes to dramatically cut heat energy consumption as well as emissions, aiming for improved system efficiencies over time and metered performance, and
- Continuing work with energy suppliers and others to reduce electricity unit prices for the long-term, including reducing the 'spark gap' in the short-term to encourage consumers to switch from fossil fuel heating. The European Heat Pump Association recommends that policy should aim to achieve a ratio of electricity to gas prices of 2.[97]

Turning back to our introductory principles, national action to reduce home heating costs makes it more likely that more Retrofit Providers will come forward with Outcomes-Based Guarantees concerned with guaranteeing costs in future – a welcome direction of travel.

[96] See UK homes losing heat up to three times faster than European neighbours | Press Release (tado.com)
[97] See HPA-Accelerating-Heat-Pump-Deployment_Domestic-Interim-Heat-Pump-Tariff.pdf (heatpumps.org.uk)

4.3 Insulating for comfort and better buildings

Carrying out good, quality assured fabric improvements to a property not only improves the building's condition and comfort levels for the occupants but supports organisations in coming forward with comfort and health-related Outcomes-Based Guarantees, such as that being offered by British Gas summarised in Section 3.1.

As was noted in that section, British Gas' offer places importance on the level of insulation in a home receiving a heat pump, and whether the level is sufficient for the system to work 'effectively' and for suitable internal temperatures to be achieved. Hence programmes to insulate homes should enable more comfort and health-related Outcomes-Based Guarantees to come onto the market.

Tackling comfort issues and poor fabric is especially important for households on low incomes or in fuel poverty who may be underheating their homes to save money. Insulating such homes before or alongside the installation of any new clean heating system, as set out in Box 12 above, is strongly advised.

National Energy Action's (NEA) heat pump guidance for local authorities stresses that through government schemes "thousands of fuel poor homes will have heat pumps installed in the coming years," and that "it is critical that these installations are managed and undertaken in a way that works for people and helps them to live affordably in a warm and safe home. Done well, this will not only tackle fuel poverty, but contribute significantly to broader social, economic, and climate objectives..."[98]

Top of the list in their advice is to "make sure the home is suitably insulated before you start [installing a heat pump], and that you can access funding for improving the energy efficiency of the home before installing a heat pump."

This advice was recently echoed by the Committee on Fuel Poverty who advised that "tackling fuel poverty among fuel poor households requires a fabric first insulation approach, completing these programmes for all fuel poor and vulnerable households, before resources are directed at the incorporation of low-carbon heating systems into those properties" and that the "best path toward sustainability for low-income households has to be a fabric first – insulation, insulation, insulation - approach."[99]

Particularly concerning is the number of fuel poor households living in uninsulated solid wall properties. The latest fuel poverty statistics for England find that properties with uninsulated solid walls had the highest rate of fuel poverty at 21.8% of households, whereas those with insulated solid walls were less than half as likely to be fuel poor.[100]

Solid wall homes are often more costly to treat than a standard cavity wall property, and for many reasons, including issues with supply chain capacity, installation rates have remained low with only around 10% of the UK's roughly 8 million solid wall properties now insulated despite many solid wall solutions being available.[101]

However, it is also the case that uninsulated solid wall properties usually have the highest levels of heat loss. As a result, whatever the heating system in use, fuel poor (and other) occupants in these types of homes are most vulnerable to comfort issues, high energy use, and high fuel bills, potentially facing devastating impacts if energy costs rise again. Failing to tackle these homes is not a viable option.

[98] See Installing-heat-pumps-for-fuel-poor-households-landscape.pdf (nea.org.uk)
[99] See Can Fuel Poverty be Ended? The Committee on Fuel Poverty Annual Report 2024 (publishing.service.gov.uk)
[100] See Annual fuel poverty statistics in England, 2024 (2023 data)
[101] See Fabric first: is it still the right approach? (journal-buildingscities.org)

Fortunately, insulating solid walls homes well can deliver very substantial energy and cost savings for the occupants, off-setting the comparatively high upfront costs over time, and substantially lowering heat pump running costs, if installed.

This point is illustrated well by the recent government commissioned Demonstration of Energy Efficiency Potential (DEEP) study. This reported that "findings from 41 fabric retrofits in 14 case study homes showed that installing a combination of draught-proofing, loft or room-in-roof insulation, new windows and doors, ground floor insulation, and solid wall insulation (SWI) could reduce whole house heat losses by up to 60%. SWI alone could achieve between 19% and 55% reductions, equivalent to between a 7% and 38% fall in fuel bills, while other single retrofits achieved fuel bill savings between <1 and 8%. SWI was also able to bring homes up to an Energy Performance Certificate (EPC) band C, and dramatically reduce the chance of surface condensation in these homes, but was also the most expensive retrofit, costing between £4,000 and £44,000."[102]

Hence, it remains vital to continue to support and expand funding for fabric improvements for low income and fuel poor households, whatever the wall type, with more linked funding for heat pumps and insulation to ensure joined-up delivery and robust quality assurance.[103] Without doing so, fuel poverty targets are in jeopardy, and the most vulnerable households risk being locked into high fuel bills for good.

For other types of household living in solid wall properties receiving a heat pump (or not), insulation should still be recommended where appropriate, with tax incentives and green finance made available to help fund the work. If a homeowner decides not to insulate when fitting a new heat pump, or any new heating system, the possible impact for comfort, energy use, fuel bills, emissions, system size, and cost, should be made clear, including any considerations if planning to insulate down the line instead.

High Temperature Heat Pumps (HTHP) which have flow temperatures at comparable levels to a standard gas boiler may be a solution to cutting emissions in some uninsulated solid wall properties where the walls cannot be treated cost-effectively or for technical reasons, but for fuel poor households in particular the first port of call should be to insulate wherever possible.

Box 21 | What level of insulation makes a home 'heat pump ready'?

A number of recent studies have looked at the question of what makes a home 'heat pump ready', estimating the percentage of homes that are technically suited to having a heat pump installed, or looking at the numbers that may be deemed 'market ready'.[104][105][106]

Other studies have analysed possible metrics and/or the level of fabric performance in individual homes that would best support large-scale heat pump roll-out.[107][108] For example, the study by BRE for the Scottish Government referenced above found that many homes with a "useful energy"

[102] See 1. DEEP Synthesis Report
[103] The government recently announced an initial £1.8 billion funding to support fuel poverty schemes for the next three years Autumn Budget 2024 – HC 295
[104] See Increasing heat pump adoption: analysing multiple perspectives on preparing homes for heat pumps in the UK (springer.com)
[105] See (PDF) Predicting the heat pump readiness of existing heating systems in the UK using diagnostic boiler data (researchgate.net)
[106] See Technical feasibility of electric heating in rural off-gas grid dwellings
[107] See BRE Client Report - Development work relating to a potential new metric for Scottish Energy Performance Certificates (www.gov.scot)
[108] See The Right Time for Heat Pumps | Passivhaus Trust | April 2024

of 120 kWh/m2/yr would likely achieve an EPC band C, a 'good' level of energy efficiency as defined in Scotland's Heat in Buildings Bill consultation in 2023.[109]

From MIMA's perspective, if a home needs substantial additional works to support a heat pump installation – such as radiator replacements, new pipework, or insulation – then, strictly speaking, in simple terms, it should not be described as 'heat pump ready'.

It is worth highlighting that in DESNZ's Electrification of Heat demonstration project, of the 742 homes fitted with a new heat pump, most of the properties with an EPC had an average energy efficiency rating of C or D already. Only 2% were F-rated, and just 1 property had the poorest energy efficiency rating of G. However, nearly all needed some form of additional work carrying out to the property.[110] 15% of the properties had fabric upgrades and 93% needed new heat emitters. These additional measures were part of the project and were included in the costings.

What is clear from such studies is that not only are fabric upgrades important in their own right, but are important for supporting successful heat pump roll-out.[111]

Hence, as minimum, MIMA proposes that:

Recommendation 6: Consumers should be advised by Retrofit Providers to insulate their homes, where appropriate, before or when having a heat pump fitted, and be fully informed of the benefits of doing so.

Detail: Heat pump customers whose homes lack wall insulation, and the full complement of loft insulation should be advised to get this insulation done where possible, checking the home's technical suitability for the measures first. The advice should include an assessment of the additional benefits insulating could deliver, including additional predicted energy savings and fuel bill reductions.

MIMA also recommends that as part of on-going EPC reforms:

Recommendation 7: Consumers should be given an indication of their home's 'readiness' for low carbon heat on the EPC, linked to a metric on the actual fabric performance.

Detail: Future EPCs should include an indication (but not a definitive statement) of a home's 'low carbon heat readiness', linked to and enabled by our proposed new fabric performance metric: an Actual Fabric Energy Efficiency (AFEE) level, described in Recommendation 2 and on Page 13.[112]

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[109] See Delivering Net Zero for Scotland's Buildings - A Consultation on proposals for a Heat in Buildings Bill. It is likely to be the case that a single heat demand level is not appropriate, and that homes with solid walls, cavity walls, and possibly even timber-framed walls need different levels.
[110] As above, see BEIS Electrification of Heat (383apps.com)
[111] See also the Government's Heat Pump Ready Programme with includes a range of projects aiming to support the deployment of heat pumps Heat Pump Ready Programme - GOV.UK
[112] See details of the proposal in 019578_207fdf523b8e43a99452fa9d81be86bc.pdf (usrfiles.com).

Referencing low carbon heat readiness on EPCs should trigger customers to think about installing heat pumps, for example, if their homes are already reasonably well insulated, and for those that aren't, the indicator should trigger a conversation with Retrofit Providers about potentially upgrading the fabric.

"Insulation and heat loss matter when you're upgrading your heating system. Proper insulation will boost a heat pump's efficiency and positively impact running costs. Older properties tend to not have great insulation. Get your home properly insulated to maximise the efficiency of your heat pump." *Daikin*[113]

"Is Your Home Insulated? – we'd recommend that your home is fully insulated as a first port of call, then consider installing an air source heat pump to heat your home." *Mitsubishi Electric*[114]

"Heat pumps work at lower temperatures than a traditional heating system, therefore insulation is key to getting the most out of the system. A poorly insulated home will not reap the benefits of a heat pump, so this should be addressed before installing one." *Nu-Heat*[115]

"Insulation helps your home retain heat, whilst preventing it from being lost through walls and ceilings. Therefore, taking the necessary steps to properly insulate your home ensures your heat pump is operating efficiently. Modern windows will also go further to minimise heat loss, and better for the environment. Although they can run at low temperatures, having a well insulated home will increase its overall efficiency and help to reduce running costs and to save on your energy bills." *Vaillant*[116]

Box 22 | The health benefits of upgrading homes

"One third of all households in the UK, 9.6 million, can't afford a decent standard of living and are in poorly insulated homes. Cold homes are a public health hazard: those living in them have much higher risk of developing poor physical and mental health and this is adding burden onto an already overstretched NHS, and contributing to poor productivity. We need urgent action to address poverty, the cost of fuel and to insulate the homes of the poorest, not just because the government has a moral duty to look after the health of its population, but also, frankly, because it makes economic sense too." *Professor Sir Michael Marmot, Director of the UCL Institute of Health Equity, on behalf of Friends of the Earth, 2024*[117]

"There is clear evidence for the health benefits of the Net Zero transition. Some of these come directly from changes required to achieve Net Zero (e.g. more active travel and dietary changes) and some indirectly from the implications of those changes (e.g. better air quality from reduced burning of fossil fuels and more liveable buildings as insulation is improved). These benefits are difficult to quantify, but unquestionably offset some, if not all, of the overall resource costs of achieving emissions targets." *Climate Change Committee, 2020*[118]

113 See What to consider when investing in a heat pump | Daikin
114 See The Ultimate Air Source Heat Pump Guide
115 See Heat Pump Insulation: Complete Guide to Insulating Your Home
116 See (1) Is my home suitable for a heat pump? | Vaillant
117 See How are the UK's cold homes impacting our health? | Friends of the Earth
118 See The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk)

5. Wider policy benefits

The sections above set out reasons for closely linking fabric upgrades and clean heat delivery in homes to secure good, reliable outcomes for individual households for the long-term. This includes the measurement, metering, and monitoring of the in-use performance of measures, as well as supporting the market in bringing forward Outcomes-Based Guarantees.

Extensive public policy benefits also follow from simultaneously reducing space heating demand and electricity consumption for heating, alongside improving housing conditions, in addition to verifying these in reality, and not in models alone. Section 5 explores such benefits for the electricity grid, fuel poverty alleviation, and the healthy homes agenda.

5.1 Electricity grid and carbon targets

By 2050 the National Energy System Operator (NESO) anticipates scenarios where home heating will largely be electrified with heat pumps playing a significant role in achieving this. Their Future Energy Scenarios 2024 set out three pathways to Net Zero in 2050 along with a 'counterfactual' scenario.[119]

Their analysis finds that Britain's energy supply in 2023 was 1706 TWh. By 2050 in the "Electric engagement" pathway, for example, annual energy supply has fallen significantly to 1222 TWh, enabled by an overall reduction in energy demand of 484 TWh compared to today. So even though demand for electricity grows significantly, this is tempered by energy demand reductions. The other pathways assume a similar magnitude of energy demand reduction. This 484 TWh reduction in demand is driven by "consumer engagement, insulation and efficiency gained through electrification." Importantly, all three pathways assume a reduction in annual residential heat demand of around 80 TWh from insulation, a massive one-third of residential heat demand in 2023.

Box 23 | Securing mass reductions in residential heat demand

The FES 2024 does not appear to give an indication of what amount of additional insulation roll-out is needed to achieve the level of space heating demand reductions assumed. One recent study[120] by Frontier Economics does, however, give an indication of the scale of additional measures needed to meet a lower 20% reduction in energy use between 2021 and 2030 from residential buildings in Great Britain – a large number:

- 6.8 million installations of loft insulation
- 3 million installations of floor insulation
- 4.6 million solid wall and cavity wall installations
- 2 million solar panel installations
- 2.5 million homes with heat pumps
- 2.1 million homes connected to a heat network
- 9.3 million homes with draught proofing and hot water tank insulation

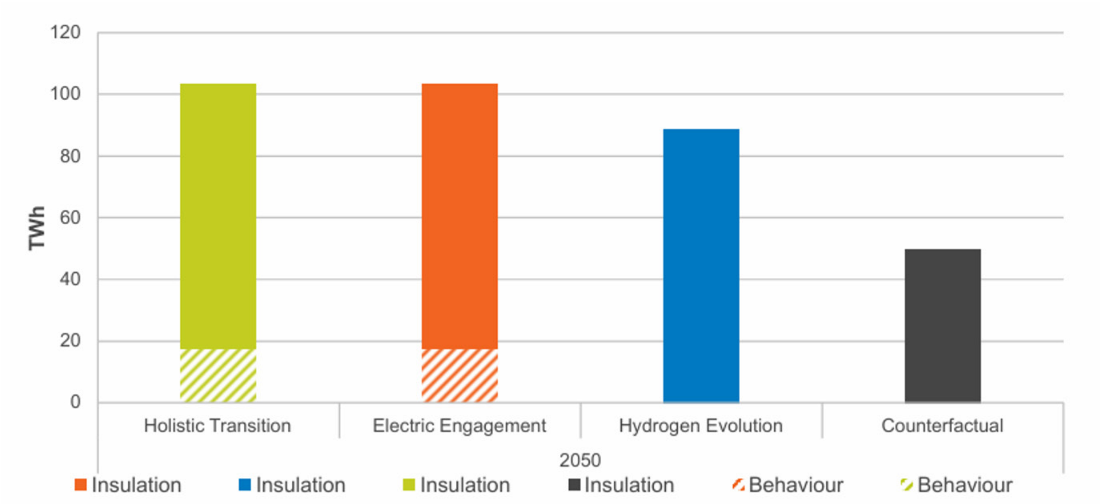
It is also clear that many homes across the UK have yet to be upgraded to a good level of energy efficiency in general, with around half with an EPC rating of D or lower and many millions without wall insulation or the full complement of loft insulation.[121] Pressing ahead with insulating such homes secures emissions reductions as well as energy savings, supporting national decarbonisation efforts while electricity grid decarbonisation gathers pace.

[119] See download (neso.energy)
[120] See Filling the gap - Report - STC
[121] See Chapter 5: Energy efficiency - GOV.UK (www.gov.uk)

The FES states that "All net zero pathways see demand reduction in residential heating due to improved insulation of households. Improved insulation measures and the associated emissions savings occur in parallel with fuel switching to low carbon heating systems, with fuel switching as a driver for some insulation measures."

Hence insulating is a critical part of reducing pressure on the electricity grid, minimising demand and reducing energy supply infrastructure costs as a result.

Figure 8 - FES scenario breakdowns of GB residential thermal demand savings in 2050



Holistic Transition

Net zero met through a mix of electrification and hydrogen, with hydrogen mainly around industrial clusters. Consumer engagement in the transition is very strong with demand shifting, with smart homes and electric vehicles providing flexibility to the grid.

Electric Engagement

Net zero met through mainly electrified demand. Consumers are highly engaged in the energy transition through smart technologies that reduce energy demand, using technologies such as electric heat pumps and electric vehicles.

Hydrogen Evolution

Net zero met through fast progress for hydrogen in industry and heat. Many consumers will have hydrogen boilers, although energy efficiency will be key to reducing cost. There are low levels of consumer engagement. Hydrogen will be prevalent for heavy goods vehicles but electric vehicle uptake is strong.

Counterfactual

Net zero missed, although some progress is made for decarbonisation compared to today. While home insulation improves, there is still a heavy reliance on gas across all sectors, particularly power and space heating. Electric vehicle uptake is slower than the net zero pathways, but still displaces petrol and diesel.

The FES again highlights the links between insulation and heat pumps: "Heat pumps are a highly efficient way of heating a home by using heat from an ambient source (like outside air ground or water) and are already a popular and effective heating choice across several countries. While some reports suggest heat pumps will be the optimal low carbon solution for residential homes, they present several installation considerations including building surveys, space requirements and upfront costs. A certain level of home insulation is also beneficial to make sure heat pump technology is effective."

Reducing pressure on the supply side through building fabric upgrades and heat demand reductions has many beneficial impacts, including delivering large reductions in peak demand and grid expansion costs.

A new modelling study at the European level[122] explored the effect of different 'renovation' scenarios[123] on the overall energy system costs required to meet climate targets, future peak demand, and the levels of transmission infrastructure investment needed. The study found that "by significantly reducing both overall and peak energy consumption [in buildings], accelerating the EU's renovation rate can substantially lower the costs associated with transmission line congestion. Until significant investments in the transmission infrastructure can guarantee grid stability, which is likely to occur closer to 2040, ambitious renovation policies can reduce these costs by up to nearly four times compared to maintaining the current renovation rate."

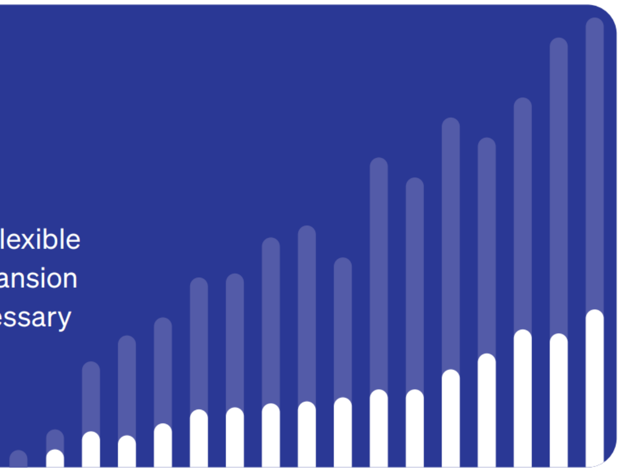
Building renovation is widely considered a key factor in flattening current and future peak demand curves. The study finds that reducing peak energy demand by around 50% compared to current renovation levels creates widespread energy efficiency and flexibility improvements in buildings, meaning associated total energy system costs are reduced by a massive €312 billion a year. Similarly, investing in large-scale building energy efficiency upgrades means major savings in terms of European grid expansion costs - see Figure 9.

The report concludes that whilst "the electrification of space heating systems is a crucial step [for Net Zero], it is insufficient on its own. Without significant investments in building renovations, Europe risks compromising its energy security and competitiveness due to increased system costs and grid complexity" and that "we must prioritise renovations that adhere to the 'energy efficiency first' principle, starting with the worst-performing buildings to maximise economic and societal benefits."

Figure 9 - Estimate of distribution grid cost savings from making European buildings more efficient

€44,2B

The energy saved by energy-efficient and flexible buildings can also help to optimise the expansion of Europe's distribution grid, reducing necessary investments to meet rising demand by up to **€44.2 billion annually.**



[122] See Resources — Your Home Our Future
[123] Three renovation scenarios covered 'business as usual maintenance', 'moderate renovation', and 'ambitious renovation' using representative U-values for walls, floors, roofs, and glazing.

Turning back to the role of measuring, metering, and monitoring. If investment decisions about renewable energy production and grid reinforcement are being made now, based on the best available analysis, and this analysis is assuming that demand for energy for home heating has been reduced by 80 TWh, it is important for this level of reduction to be achieved in reality and not only in models. Otherwise, the consequences for the grid could be high. Verification of actual heating demand reductions, made one property at a time, add up to greater security on the supply-side.

Box 24 | Meeting the 2030 Clean Power Target

"One of the fastest ways to reach the 2030 target of a clean power system is to rapidly decarbonise our building stock and make it far more efficient, ultimately reducing the amount of electricity we need to use." *Energy UK, 2024*[124]

The same need for verification applies to emissions reductions. For instance, the Climate Change Committee's (CCC) Sixth Carbon Budget 'Balanced Net Zero Pathway'[125] assumes a significant deployment of fabric measures to achieve a 12% reduction in national heating demand by 2050. For instance, "in total, 15 million households receive one of the main insulation measures (loft/ wall/floor)" and "we include solid wall insulation in just under half of all uninsulated solid-walled homes (3.4 million in total) including all those in fuel poverty." The CCC's other scenarios assume even higher levels of ambition.

By 2030, the Balanced Pathway also assumes that most heating installations are low carbon, predominantly heat pumps.

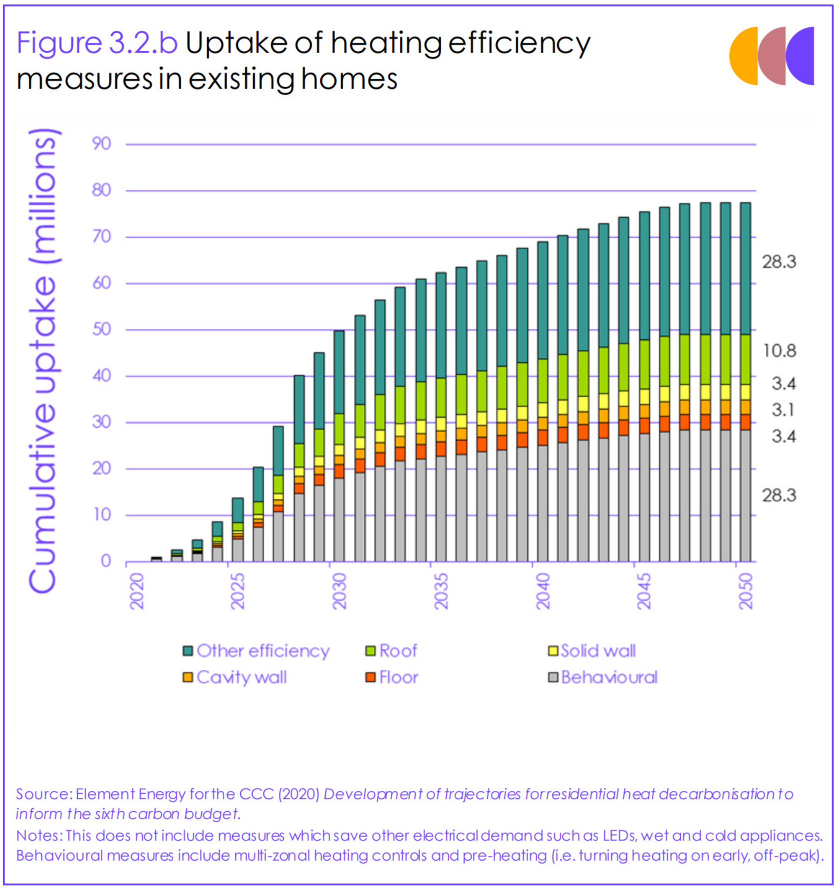
Again, making measurement of fabric performance and heat pump efficiency a standard part of future retrofit projects allows us to feel more confident that emissions targets are being met in reality, and helps to cement the UK's position as a leader on tackling climate change. Furthermore, the CCC has repeatedly flagged the importance of closing performance gaps, including in relation to new homes,[126] and considers that "higher savings are possible with greater improvements in tackling the performance gap, innovation and public engagement."

[124] See Energy-UK-Explains-Energy-efficiency-.pdf
[125] See The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk
[126] See UK housing: Fit for the future? - Climate Change Committee (theccc.org.uk)

Box 25 | CCC energy saving assumptions

A typical household in the CCC's Sixth Carbon Budget Balanced Pathway "which installs cavity wall insulation, loft insulation, and floor insulation sees heat demand savings of 30%, while very deep retrofits might deliver savings in the region of 57%."

Figure 10 - CCC Sixth Carbon Budget uptake of heating efficiency measures in existing homes



5.2 Protection from price shocks

In January 2023 during the recent energy crisis and following high wholesale energy prices Ofgem set default unit prices at 67p per kWh for electricity and 17p per kWh for gas. This meant the annual energy bill for a typical dual fuel user on a variable tariff could have been a staggering £4,279 per year, almost triple today's prices.[127]

Fortunately, households were protected from paying such high bills as emergency government interventions were made, including the Energy Price Guarantee. This kept typical dual fuel bills capped at £2,500 per year. The Office of Budget Responsibility forecast that the total 'energy support package' for consumers cost the Exchequer £52.2 billion for the year 2022 to 2023 alone, with additional budget for the following year.[128]

[127] See Latest energy price cap announced by Ofgem | Ofgem
[128] See The cost of the Government's energy support policies - Office for Budget Responsibility (obr.uk)

Whilst it is understandable that the Government needed to intervene during such unprecedented times, future price shocks cannot be ruled out. Energy prices rose again slightly in January 2025,[129] and the cost of energy has been forecast to remain above 2022 levels until at least 2030.[130]

Action is already being taking across the UK's energy system to increase home-grown clean energy, intended to reduce the reliance on gas imports and participation in volatile global markets, as well as cutting emissions. Reducing energy demand is also key to making a more secure energy system. The less energy we need, the less we must produce.

At the household level, real, verified reductions in energy consumption for space heating through fabric measures protects consumers from the potential for sky-rocketing bills. Very high energy bills driven by price shocks are crippling for many households, but for those in fuel poverty the impact could be life-threatening. It is notable that the scale of emergency energy support funding issued from 2022 to 2024 is in a similar ballpark to the amount industry groups estimate is needed to upgrade all fuel poor homes in England.[131]

Unit prices at 67p per kWh may never be realised in future if government intervention is assumed, but either way, getting prepared by upgrading homes helps to minimise the size of any future emergency budget needed.

5.3 Assured improvements in housing conditions and health outcomes

As discussed, there are many good reasons to insulate homes that need it, beyond supporting the transition to clean heat, including improved comfort for households and lower energy bills in general.

In addition, mineral wool insulation in particular has a range of other important benefits. For instance, it absorbs sound energy very well, meaning it can improve the acoustic performance of a home's walls, floors and roof.[132] It is also 'breathable', and as a part of whole-house design strategy, can limit the risk of damp and mould.[133] It is non-combustible and so provides in-built fire protection and effectively contributes to the fire safety of buildings.

Hence, good insulation, installed well can improve housing conditions. Better housing conditions mean better health and well-being for UK citizens, reduced pressure on the NHS, and potentially, lives saved.

Between 3.2 and 6.1 million people are living in fuel poverty in England,[134] and millions across the UK have poor quality housing with damp and mould, or other issues such as poor indoor air quality and overheating, all of which affect comfort, health and well-being. The Welsh Government identifies that the recent energy crisis put an estimated 45% of Welsh households at risk of fuel poverty.[135]

BRE research in 2023[136] identifies that 2.4 million homes in England have one of the most serious health and safety hazards,[137] including damp and mould. If rectified at a cost of around £9 billion, this would provide societal benefits of £136 billion over the next 30 years.

[129] See CBP-9714.pdf (parliament.uk)
[130] See Expect high power prices until 2030, says leading industry expert | The Standard
[131] See eeig_tomorrow-s_homes_today_0224.pdf (theeeig.co.uk)
[132] See below.
[133] See Box 26.
[134] Depending on the definition of fuel poverty used. See Annual fuel poverty statistics in England, 2024 (2023 data)
[135] See Heat strategy for Wales
[136] See bre_the_cost_of_ignoring_poor_housing_report_web (bregroup.com)
[137] Classified under the Housing Health and Safety Rating System.

BRE also estimates that the NHS is spending over £1 billion a year on treating people affected by poor quality housing. Their report discusses how heating and insulation upgrades helps to solve such problems, amongst other interventions.

Box 26 | Tackling damp and mould

There have been a small number of cases where insulation has been badly installed or applied to unsuitable buildings, and damp and mould has formed as a result. However, this is rare and should not happen when materials are properly installed.

The retrofit industry has been engaged for some years in reviewing and updating retrofit standards to tighten up design and specification processes so that the right materials are applied to the right buildings in the right way and this vital work must continue.

MIMA's members have also continued to work closely with the construction and renovation sector to increase understanding of moisture risk in buildings and raise awareness of how to manage it.[138] For example, many walls are designed to be 'vapour open', meaning water vapour can pass freely through allowing them to 'breathe' and dry out where needed and assisting in preventing moisture build-up. Insulating using 'breathable' products, including mineral wool, which has virtually no resistance to water vapour movement, is therefore an important part of strategies for managing moisture risk.

Many households also suffer from noise pollution, if living near a busy road, for example. As above, certain types of insulation, including mineral wool insulation, can alleviate the issue by providing protection from noise.

MIMA member ROCKWOOL carried out a consumer survey in 2021 to investigate this issue.[139] They found that "77% of the UK population deal with unwanted noise whilst in their homes", and that "the increase in unwanted noise is also having a harmful effect on the wellbeing of the UK's population, with two-thirds (65%) of those surveyed saying it negatively affects their mood."

They note that the World Health Organisation has found that at least one million healthy life years are lost every year in Western Europe as a result of exposure to environmental noise, making it the second largest environmental cause of ill health after air pollution. Also, studies have shown that exposure to unwanted noise can contribute to sleep disturbance, hypertension, and an increased risk of diabetes, dementia, stroke and heart disease.

ROCKWOOL observes that "this is a massive issue currently flying under the radar. With more people now likely to work from home after the pandemic and increasing populations in our towns and cities, noise has the potential to be a critical issue and have a negative impact on people's physical and mental health. High-quality housing with good acoustic design can go a long way in addressing noise issues."

Turning back to our recommendations, policies which encourage Retrofit Providers to verify that homes have genuinely high-performing fabric and heating systems following retrofit means we can be more confident in securing the nationwide health benefits associated with better housing, including improved comfort, indoor air quality, acoustic performance, and other indoor environmental conditions.

[138] For example, see Moisture guidance for existing homeowners - UK Centre for Moisture in Buildings
[139] See ROCKWOOL publishes new data on the impact of noise 2021 - NEWS

6. List of Recommendations

A successful and smooth transition to a Net Zero building stock will only be realised with high levels of consumer trust and confidence in home fabric upgrades and clean heat projects.[140]

To help build consumer confidence MIMA strongly believes it is of paramount importance for UK policy to transition to a framework which places much greater importance on verifying the actual energy performance of housing, which will, in turn, enable an ever-growing number of Retrofit Providers to offer their customers Outcomes-Based Guarantees. This action is intended to avoid households being left to shoulder the risk of poor outcomes such as unexpectedly high heating demand and fuel bills.

The policy and standards guiding the delivery of fabric upgrades and clean heating systems must seek to secure reliably good, proven outcomes. That means aspects of a home's energy and carbon performance are routinely measured, metered, or monitored.

We are also beginning to see some great examples of Outcomes-Based Guarantees on the market, some of which are illustrated in Section 3 of this paper. The following recommendations are intended to enable the performance testing and Outcomes-Based Guarantees market to grow and succeed.

Outcome wanted: Build consumer trust.

Consumer trust and confidence in home energy efficiency and clean heat upgrade projects is high due to people getting reliably good, proven outcomes.

Proposed solution: Drive the market for the measuring, metering, and monitoring of home fabric and clean heating system performance.

Government policy and industry standards to drive the market for the testing and verification of the energy performance of homes so that, over time, any UK household who wants to have their home's actual fabric or clean heating system performance checked can get this service from or through their Retrofit Provider as a standard part of an energy efficiency upgrade project.

To achieve this MIMA recommends the following:

Recommendation 1: Government to set an aspirational Target in the Warm Homes Plan to make measuring, metering, and monitoring of home energy performance the norm.

Detail: Government to set a Target in the Warm Homes Plan that by 2030 all UK households getting a home fabric and/or clean heat upgrade will be able to opt for a service from their Retrofit Provider which includes checks of the actual performance of the fabric and clean heating system, pre- and/or post retrofit as appropriate, using accredited methods, technologies, and forms of monitoring. Relevant industry standards would require Retrofit Providers to demonstrate that an offer to measure, meter, or monitor the fabric and/or the heating system has been made to customers.

[140] Helping to avoid the type of 'backlash' seen in Germany over their Heating Bill How heat pumps exploded Germany's ruling coalition – POLITICO

Rationale: The new government creates a truly world-leading retrofit framework based on measured performance, helping to re-invigorate consumer appetite for and trust in home energy upgrades and energising the supply chain to come forward with innovative and exciting Outcomes-Based Guarantees.

Recommendation 2: Government schemes to incentivise the measurement, metering, and monitoring of home fabric performance and clean heating systems, moving towards making this mandatory in government funded energy efficiency programmes.

Detail: To support Retrofit Providers in bringing forward more measurement, metering, and monitoring of building energy performance in the short-term, and to make headway on MIMA's proposed 2030 Target, government should proactively incentivise checks of home fabric performance and clean heating systems, including by:

- Expanding 'pay for performance' policies such as that being consulted for ECO4.[141]
- Updating EPCs to include the capacity for assessors to input measured data collected on a building's fabric performance, and potentially other measures, to improve the accuracy of the EPC rating, plus new metrics to drive such measurement, including an Actual Fabric Energy Efficiency (AFEE) rating.[142 143]
- Developing policies based on concepts which place a value on the energy we do not use,[144] in addition to policies we already have to increase energy supply, and particularly renewable energy.

Rationale: Incentives and rewards can trigger more and a wider range of performance testing approaches and Outcomes-Based Guarantees, greater innovation, and better outcomes for consumers sooner rather than later, without forcing a one-size-fits-all approach.

Recommendation 3: Government to set a framework for the accreditation of methods and technologies used for fabric testing and heat metering and require that accredited approaches are used by Retrofit Providers.

Detail: As a minimum, fabric performance testing and heat pump heat metering offered by Retrofit Providers to customers as part of a home upgrade in pursuit of the 2030 Target, must use accredited methods and technologies, as defined by the Government in consultation with industry, and which includes requirements relating to accuracy, referencing existing standards as appropriate.

Rationale: Fabric testing and heat metering are critical enablers of a successful transition to a Net Zero building stock, meaning consumers can feel confident they are getting the performance they paid for. Both forms of monitoring are now possible at reasonable cost and minimal disruption and these tests are already underpinning existing Outcomes-Based Guarantees. It is essential testing technologies perform in line with agreed parameters.

[141] See Energy Company Obligation 4 and the Great British Insulation Scheme: mid-scheme changes - GOV.UK
[142] The government's current consultation on EPC Reform includes proposals on this topic. See Reforms to the Energy Performance of Buildings regime - GOV.UK
[143] See Box 21.
[144] Sometimes referred to as 'Negawatts'. See Kickstarting_negawatts.pdf

Recommendation 4: Retrofit Providers should fit the smallest heat pump system possible, enabled by measuring the home's actual heat loss and improving the building fabric where appropriate.

Detail: Industry standards should seek to ensure that Retrofit Providers are specifying the smallest heat pump system possible to achieve desired internal temperatures, in order to potentially reduce up-front and running costs for the consumer. This goal is enabled by improving the building fabric, where appropriate, especially if the home's heat loss is high, and by measuring the fabric's actual performance.

Relevant industry standards should require Retrofit Providers to record for a household what steps will be taken to reduce the size of their heat pump system, including insulating.

Rationale: The smaller the size/capacity of the heat pump system needed, the lower the energy consumption, and the lower the upfront and running costs are likely to be.

Recommendation 5: The Warm Homes Plan should target all three determinants of space heating costs together: heat demand, heating system efficiency, and energy unit prices, to reliably and permanently reduce energy bills.

Detail: The Government can drive down home heating costs for all, for good, by acting on all three determinants of space heating costs in tandem: heat demand, heating system efficiency, and energy unit prices.

Rationale: This approach also helps to de-risk building decarbonisation policy by ensuring no single element of the 'Affordability Equation' is overly relied on to lower people's energy bills, and helps the Government to meet its manifesto commitment.

Recommendation 6: Consumers should be advised by Retrofit Providers to insulate their homes, where appropriate, before or when having a heat pump fitted, and be fully informed of the benefits of doing so.

Detail: Heat pump customers whose homes lack wall insulation, and the full complement of loft insulation should be advised to get this insulation done where possible, checking the home's technical suitability for the measures first. The advice should include an assessment of the additional benefits insulating could deliver, including additional predicted energy savings and fuel bill reductions.

Rationale: This recommendation supports the achievement of many UK policy objectives, including tackling fuel poverty by 2030, improving housing conditions, health and well-being, meeting carbon budgets, improving energy security, and taking the pressure off the electricity grid.

Recommendation 7: Consumers should be given an indication of their home's 'readiness' for low carbon heat on the EPC, linked to a metric on the actual fabric performance.

Detail: Future EPCs should include an indication (but not a definitive statement) of a home's 'low carbon heat readiness', linked to and enabled by our proposed new fabric performance metric: an Actual Fabric Energy Efficiency (AFEE) level, described in Recommendation 2 and on Page 13.

Rationale: Research suggests that the vast majority of homes will be suited to a low carbon heating system, such as a heat pump, but some will need more work than others to prepare them. A new EPC indicator should trigger the switch to clean heat as soon as possible for homes that are already genuinely 'ready'.

7. Next steps

MIMA is interested in the views of our colleagues in the energy efficiency and retrofit sector on the issues raised in this paper and the recommendations made.

We would welcome further discussion and collaboration with government and the industry to develop and refine the recommendations.

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Annex

Frequently asked questions

Q1. MIMA is proposing that the Government sets a 'Target' for all Retrofit Providers to be in a position to offer their customers testing and monitoring services by 2030, should households wish to take this up. What does 'Target' mean in this context?

This would be an aspirational national target in the Warm Homes Plan which sets a positive direction of travel for the retrofit industry, in a similar vein to the Government's target for as many homes as possible to achieve an EPC band C by 2035.

MIMA is not proposing that the Target itself is regulated, but the accreditation and approval of testing methods and technologies would be essential.

No Retrofit Providers would be forced to do anything. But as our 'ask' is for the Government and standard-setters to proactively incentivise fabric testing and heat pump performance monitoring in the run up to 2030, before becoming mandatory for government-funded energy efficiency programmes, those who do not may, over time, become less attractive to consumers.

Q2. Who are the Retrofit Providers the Target applies to and does it cover Providers of all types of energy efficiency retrofit measures?

A Retrofit Provider is a generic term being used for the purposes of this paper. It means a company or organisation who contracts with a customer to provide a retrofit service to them, for example, fitting a heat pump and upgrading the loft insulation.

A Retrofit Provider may be a large organisation who works with a network of suppliers or sub-contractors, or a small company operating independently, who is a member of a representative body who assists them with information about policy and regulatory frameworks.

For larger organisations with sub-contractors, the Retrofit Provider could support individual suppliers with regards to providing testing and monitoring services, potentially setting out the type of 'offer', negotiating deals and bulk buying of testing kits, heat meters, and sensors etc, and by agreeing detailed contractual terms and conditions with respect to this aspect of retrofit projects.

For smaller independent companies, there could be a similar role for existing advisers, certification bodies, or guarantee providers to support their members with testing and monitoring services.

In terms of the type of measures included in the Target, this paper is focused on Retrofit Providers as organisations who upgrade individual homes or carry out larger projects, installing heat pump systems and/or fabric measures (and any ancillary measures required). Installer teams would ideally be trained to fit both measures. The Target would apply to retrofit jobs for consumers who have already decided to go ahead with the project, installing suitable measures. However, the Government could choose to define the Target more broadly.

Q3. What does MIMA mean by an 'Outcomes-Based Guarantee'?

A 'guarantee' in this context is an umbrella term describing the types of market offerings a commercial company, contracting with a consumer to provide retrofit services (a Retrofit Provider), could make which are 'outcomes-focused'. For example, a commitment to deliver an agreed level of annual space heating demand saving and verification that this has been achieved in practice.

It is not a one-size-fits-all government-produced generic guarantee of building energy performance with detailed rules set out in legislation.

Also, it is not the same as the type of guarantees the industry already provides, including under government energy efficiency and clean heat schemes, which exist to protect consumers from defects and poor workmanship.

Individual companies, Retrofit Providers, are being encouraged and enabled to bring forward their own Outcomes-Based Guarantees, the terms of which are defined in detail by the companies themselves. A market-led approach which should see a wide variety of Outcomes-Based Guarantees being offered to consumers.

Q4. What does the 2030 Target mean for organisations already offering Outcomes-Based Guarantees?

Companies already offering Outcomes-Based Guarantees of the form envisaged in this paper should begin to benefit from a policy framework which rewards this, and those guarantees would contribute to the Government's 2030 Target.

However, as above, it is important to distinguish between the types of guarantees being proposed by MIMA, and long-standing types of guarantees already provided for individual measures under existing quality assurance frameworks. These are concerned with protecting consumers, for example, by seeking to ensure the installation of a given measure meets relevant retrofit standards and by providing remedial works if problems or 'defects' in the installation emerge.

There are several organisations that operate in the consumer protection space, which offer measure-related guarantees, such as the Installation Assurance Authority (IAA) and the Solid Wall Insulation Guarantee Agency (SWIGA). For instance, The CIGA and IAA Guarantee "covers defects in materials or workmanship, and in the event of a problem The IAAs technical department is there to help."[145]

Further careful consideration will need to be given to the interaction between the type of Outcomes-Based Guarantee MIMA is proposing is incentivised, and the existing consumer protection and guarantees landscape, but we would stress that Outcomes-Based Guarantees would be market-based offerings, additional to, not seeking to replace essential consumer protections.

[145] See About CIGA | CIGA

Q5. How would the new testing framework and Outcomes-Based Guarantees interact with compliance with Building Regulations and other legal requirements for retrofit projects?

All retrofit projects must comply with relevant legislation, including building regulations. Guarantees under this framework would form part of the contract with the consumer and are not part of regulatory 'building control compliance'.

Q6. Will offering customers testing and monitoring services mean higher retrofit project costs?

Potentially, yes, where a customer decides to take-up a retrofit offer which includes testing or monitoring.

However, it is critical to understand that this would be their choice. Ultimately, consumers can still opt for a service which excludes testing. However, we expect that when offered the option to have certain energy-related outcomes of their home checked, many consumers will want this, even at a modest additional cost.

We also propose that policymakers explore possible approaches which allow measurement or monitoring at no additional cost to consumers, at least for the short-term. For example, if, following a fabric upgrade a homeowner has opted to pay for measurement or monitoring to verify the improved energy performance of their property, this assured saving has a value to society, and it is reasonable then, for the homeowner to be compensated in some way to help cover the cost of the monitoring.

Another possibility includes linking policies on testing and verification to tax incentives such as stamp duty rebates for energy efficient homes. For example, when energy savings from the scheme are guaranteed, a slightly larger rebate could be provided compared to projects which do not, helping the customer to re-coup the cost.[145] [146]

Q7. If the 2030 Target is not regulated how would the Government monitor progress against it?

In terms of measuring progress towards the 2030 Target, the process would need to be agreed in consultation with the industry, but it should avoid placing onerous reporting requirements on companies.

As above, clear requirements for the validation and approval of measurement and monitoring methods and technologies will be needed, even if the Target itself is not regulated.

[145] See Energy Saving Stamp Duty Incentive (ESSD) - INFOGRAPHIC and Energy-Saving-Stamp-Duty-Incentive.pdf
[146] See https://ukgbc.org/wp-content/uploads/2024/03/Energy-Saving-Stamp-Duty-Incentive.pdf

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