
Carbon Co-op

My Home Energy Planner



Report prepared for
Client Name

Address
Client Address

Local Authority Area
Manchester

If you have any questions about this report, please contact info@carbon.coop or 0161 448 6492.

Welcome to My Home Energy Planner

Aims and content

This report is the first step on your journey to transform your home into a more comfortable and sustainable place to live. It will help you understand your home's current condition, clarify your project aims, and understand the potential for improvement. We provide you with an overview of the steps to take, outline what works can be done together, and their likely impact. This report includes information gathered during our survey visit. Your assessor has used this information to develop a range of scenarios for improvement, outlined below.

Section 1 outlines **your initial project brief** as discussed with your assessor. It is important to be clear about your priorities, so they inform your decisions. This is a starting point for the future development of your detailed project brief.

Section 2 provides **basic information on the existing condition** of your home. We consider indoor environmental quality and any repair work that you might need to do. We describe the context of your home and potential constraints.

Section 3 outlines the **retrofit scenarios** created in this report. These map out a pathway to significant energy and carbon emissions reductions for your home, usually building from 'easy wins' to a full deep retrofit. We compare and benchmark these scenarios against targets and your existing energy use.

Section 4 gives a **summary of the specific measures** involved in each scenario. It includes a commentary highlighting things you might need to consider in developing your plans. (Note that Appendix A provides further detail on each of the measures).

Section 5 provides an outline of **what you might do next** to achieve your aims. Many measures will require further investigation, design, or specialist advice, beyond the scope of this report. This section provides ideas about how to progress this.

The **appendices** provide further detail on the scenarios and useful information such as a **glossary** of retrofit terms and a description of the assessment methodology.

Our Approach - homes ready for a zero carbon future

Designed for you

Our advice is tailored to you and your home. Our recommendations are informed by what you told us about how you live in your home. The scenarios consider your priorities and future plans. We also take into account things like your tolerance for disruption, tailoring the scenarios to suit your needs. Through the way you live or changes you've made to your home, you may already be on the way to being 'zero carbon'. However, if you are under-heating your home to achieve this, you may have noticed other problems such as condensation, mould or poor indoor air quality. This may in turn affect your comfort and health. You can change this through energy efficiency improvements. This may mean you can't make big savings in energy use with more 'light touch' measures, but these can make you warmer. Alternatively, you may find that you are using far more energy than we predict in our model, and that a few simple steps could help reduce this. My Home Energy Planner is designed to help you understand the best next steps to take whatever your circumstance.

Whole house

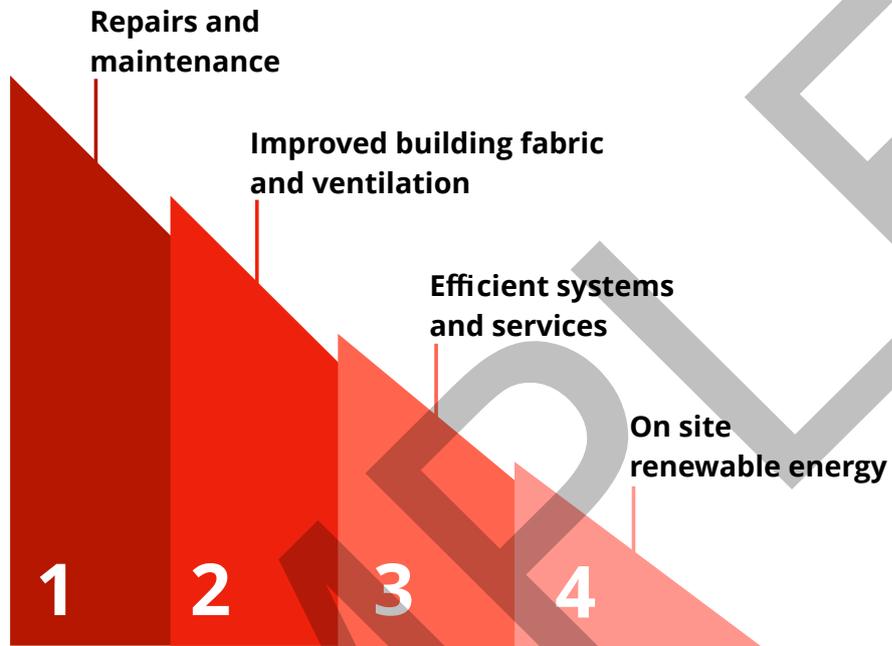
We think about your home as a set of interacting systems, that all affect its capacity for retrofit. This means we consider a broad range of factors, not just energy use or bill savings. These include: occupant comfort, ventilation and indoor air quality, maintenance needs, aesthetics and heritage. We use a model that includes all energy uses - including appliances - not just those covered by the building regulations. We consider retrofit measures together, rather than in isolation. We develop a holistic understanding of your home to assess the relative effect of measures. This allows us to identify how improvements can work together to create better outcomes. It also helps to reduce the risk of negative unintended consequences.

Fabric first

We take a 'fabric first' approach to building improvements. We prioritise repairs, insulation, draught-proofing and ventilation ahead of 'add ons' like solar panels. We do this for a few reasons:

1. We know this approach works and is reliable. 'Fabric first' done well reduces the risk of a 'performance gap' between design expectations and built reality.
2. It has many co-benefits. It makes homes more comfortable and easier to keep warm and healthy, as well as protecting the building fabric.
3. Reducing energy demand first makes it easier for efficient building services to meet household needs.
4. To enable the decarbonisation of the whole energy system we need to reduce energy demand. Reducing the need for heat in homes through a 'fabric first' approach is a big part of this.

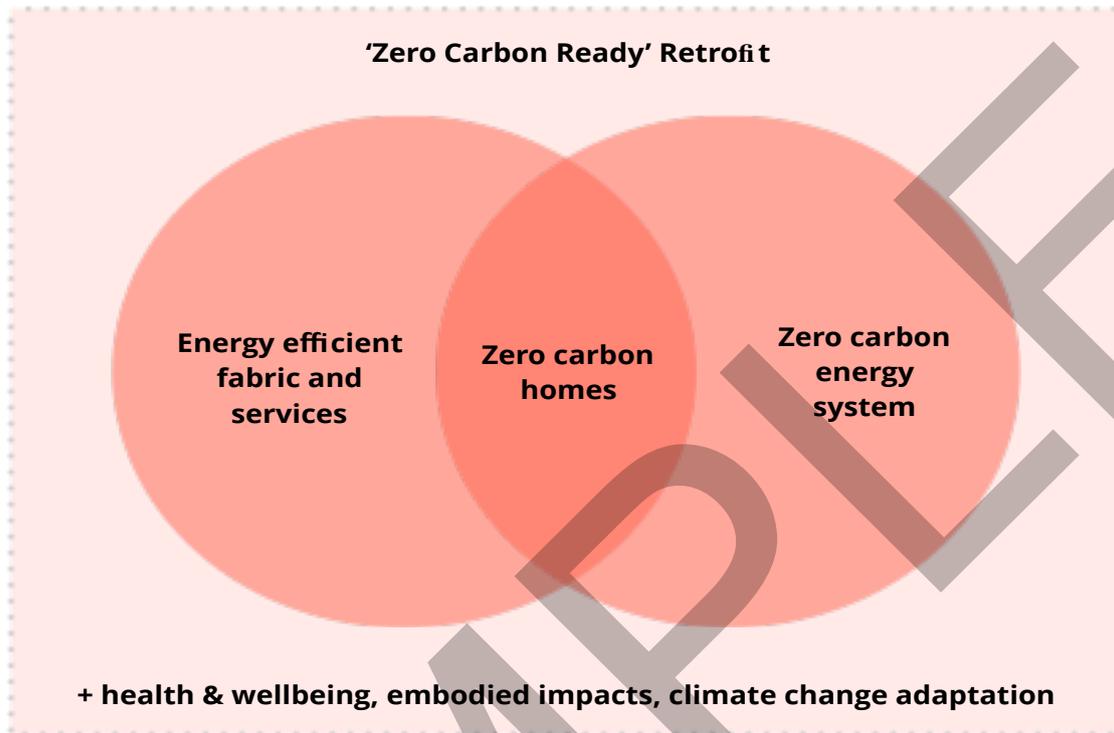
Figure 1. Fabric First Diagram



Science-based Targeting

We set ambitious targets for deep retrofit that are in line with expert climate science and national legislation. The final scenario in this report gets as close to these targets as possible. We do this using technologies that are available now, though you don't have to do all of this work at once! The other scenarios show you steps along the way, including DIY and simple improvements. We show you the full range of what is required to make your home 'zero carbon' ready.

Figure 2. Being Zero Carbon Ready



Whole Systems Thinking

We focus on energy use rather than carbon dioxide emissions. This is because to decarbonise the UK's energy system we need to massively reduce energy use. As the national electricity grid uses more renewable energy, its carbon emissions reduce. In many cases switching to from fossil fuels to electrically fuelled heating will reduce carbon emissions. But the grid at present does not have the capacity for everyone to do this. In addition, because electricity is more expensive than gas, this would increase fuel bills. To avoid this, and to support the transition of the whole system, we focus on reducing demand. We do this through 'fabric first' measures like insulation and draught-proofing. This 'futureproofs' your home and supports a zero carbon future.

Fossil-Fuel Free Heat

The biggest use of energy in most homes in the UK is heat - heating the home (otherwise known as space heating) and for hot water. In most cases this is provided by fossil fuelled systems like gas boilers. This needs to change quickly to achieve zero carbon targets. In deep retrofit scenarios we generally suggest that a fossil-fuel free heating system is fitted. We will also make suggestions about when it might be best to replace your existing heating system - depending on its current age and efficiency and what is planned in other scenarios. We generally do not suggest new biomass or wood based heating systems. This is because burning wood emits carbon dioxide and also creates air pollution. Given the time we have to tackle climate change, there is no guarantee that this carbon will be reabsorbed in time by new trees.

Including 'up front' impacts

By retrofitting rather than building a new home, you will reduce the environmental impact of your project. This is because you will be re-using existing materials and infrastructure. We suggest lower impact options for retrofit measures where we can. This considers issues like deforestation, pollution, toxicity and health effects, as well as the energy used to make new materials.

Modelling Transparency

My Home Energy Planner is an open source energy modelling tool. It's adapted from the UK's national calculation methodology, SAP (which stands for Standard Assessment Procedure). It makes assumptions about external climate, heating patterns, hot water, lighting and appliance use that in turn affect the results produced. These assumptions are based on UK standards, published research, our experience and observations made by your assessor. We compare the results of the model against your actual energy use data wherever possible. This allows us to adjust the modelling and recommendations where appropriate. We strive to be accurate, but understand that any model is an approximation. It can be helpful in comparing options, but cannot fully reflect reality. We state our assumptions, so you are aware of the context in which our recommendations are made. As an open source tool it is also possible for you to examine the code of My Home Energy Planner.

Addressing the Performance Gap

In too many projects there is a gap between expectations and reality. This can be about not achieving anticipated energy savings or comfort improvements. This can be caused by incorrect assumptions in modelling and design, poor detailed design, and/or poor quality control during construction. In our modelling we attempt to account for this by making conservative estimates. We also adjust our assumptions to match your circumstances and compare projected outcomes against actual bill data where possible. In addition, for each measure proposed we note the main performance risks occur and suggest ways to mitigate them. Further information on how to manage this during your project can be found in section 5.0 'Next Steps'.

Continual Improvement

We are always seeking to learn and improve. My Home Energy Planner is the result of a collaborative effort over the last decade, with input from architects, retrofit specialists, programmers and householders. Our methodology is informed by standards like PAS2035 and the work of organisations like the Association of Environmentally Conscious Building (AECB) and Sustainable Traditional Buildings Alliance (STBA). If you have comments or suggestions for improvement, please do not hesitate to contact us.

Disclaimer:

This report recommends potential retrofit improvements for your home. It is intended to support the initial decision-making process for your project. We take reasonable skill and care to ensure that the information in this report is of a level of accuracy and completeness sufficient for this purpose. This report is not a detailed construction plan or design proposal. We suggest minimum performance targets so that the potential impacts shown in this report are achieved - however these should be confirmed and checked by your design team and/or installers, with due consideration given to any of the risks highlighted in this report. It is not suitable for use as construction information. Information should be verified by an architect or retrofit designer before carrying out detailed design and construction work.

1 Your Aims

It is important that in planning the work to your home that you understand and are able to communicate your priorities to any professionals or builders you're working with. In this section we record what you told us about your aims and your approach to the retrofit project.

1.1 Your Plans

You told us that you have lived in your home for **2-5 years**.

You told us that you plan to stay in your home in the **long term (10 years plus)**.

You told us that you **do not** envisage any significant changes to your lifestyle.

Comment: At some point both will be at home

You told us that you **are not** planning other building works in your home.

You hope to start retrofit work on your home in the next **3-6 months**.

1.2 Your priorities

You told us what was most important to you in considering energy efficiency retrofit options for your home. We have considered these preferences in developing the scenarios set out in this report.

Your priorities were:

1. Save carbon
2. Save money
3. Improve comfort

You told us that the key qualitative criteria in planning works to your home are:

You told us that you **would** mind changing the appearance of your home inside.

You told us that you **would** mind changing the appearance of your home outside.

Comment: Conservation area, even if could do something to the back doubt you would. Internally would depend on what was involved. Keen to retain mouldings, fireplaces etc.

1.3 Logistics

You told us that you plan to do the work **in phases**.

You told us that you **were not** willing to do some of the work yourself.

Comment: in phases, Can do decorating

When thinking about the disruption involved you told us that you would be willing to live with **having to redecorate in some rooms**.

Comment: could probably decant one room at a time to strip out

You told us you **would work out your budget after understanding what was possible**.

Your assessor understands your initial project brief and scope to be:

(NOTE TEXT HERE DOES NOT RELATE TO PIC ABOVE! EXAMPLE TEXT ONLY) The property is the end of a striking early Victorian terrace. As such it is in a conservation area and the owners are reluctant to significantly alter it's appearance internally or externally. But they are strongly motivated to reduce carbon and keen to get started on this fairly soon. They would also like to reduce costs and improve comfort. One householder is an asthma sufferer so that also needs consideration. Due to the amount of ornaments etc fully decanting will be impossible. Most likely works will be done in phases room by room.

SAMPLE

2 Your Home Now

To make effective improvements to your home you need to understand where you're starting from. Taking a fabric first and whole approach isn't just about improving insulation or air-tightness.

Before carrying out improvement works, you should fix damaged structures and make sure general maintenance is in good order. If this is ignored it can mean energy efficiency work exacerbates existing problems or creates new ones. This can damage your home or mean that insulation and other measures don't perform as well as they could.

Identifying the existing condition can also be helpful to identify problem areas like cold or draughty rooms. These can then be addressed in the scenarios suggested in this report.

Understanding the context of your home also helps in general project planning. It helps to identify climate change adaptation needs, such as addressing flooding or overheating risks.

2.1 General Property Information

Property type: Semi-detached or end terrace

Number of bedrooms: 4

Internal floor area: 133.3m²

This is not a full building inspection and condition survey, and it should not be used as such.

We strongly recommend you seek further advice from a surveyor or structural engineer for major works. This is particularly important where structural alterations are planned, or potential structural problems have been identified. We will however notify you if we see something in your home that concerns us as to its safety or condition.

We do not carry out invasive surveys as part of this report. We also do not access areas where to do so would cause undue risk to the assessor. We therefore have to make some assumptions about the construction of your home in preparing this report. These may need to be verified by further investigation and detailed condition surveys to inform detailed planning and design work.

2.1.1 General construction

Based on the information provided by you and our survey, the general construction of the property is as follows:

Floors:

suspended timber

Walls:

solid brick

Roof:

cold slate roof with attic conversion in part of space

Windows and doors:

mix of timber DG and SG

Construction ventilation:

many airbricks visible in gable end from outside but not inside. Cellar space heavily ventilated

Evidence of moisture ingress or leaks (including internal):

no

2.1.2 Works already undertaken

You told us you had already made the following improvements to your home: Windows (previous) Floor insulation ceiling of cellar, most Ground floor (handy man by this owner) Conservatory (previous)

2.1.3 Past, Current and Potential Structural Issues

You told us: Steel beam needed attention on purchase in cellar

We noted that: Subsidence in garage which is not attached the main house and was known to have been badly built.

2.1.4 Damp, condensation or mould

You told us: Some damp in rear and internal wall has been treated. Other spots of flaking

We noted that:

2.1.5 Heating and water services

Your space heating is currently provided by: gas combi boiler

Which you control by: timer and thermostat some TRVs hysteresis on thermostat means can overheat or get cold so has to be manually triggered by changing

Your hot water is currently provided by: Combi boiler, no taps

2.1.6 Utilities

Your home has a mains electricity connection.

Your home has a mains gas connection.

Your home has a mains water connection.

Your home has a mains sewer connection.

2.2 Ventilation and Indoor Air Quality

Your well-being and the internal environmental conditions in your home are affected by indoor air quality. Damp, dry, or polluted air can create or exacerbate a range of health conditions. It can also affect the health of the building structure, creating surface or hidden condensation, mould and risking rot.

The best way to avoid these issues is to have a well-designed and well-functioning ventilation system, in accordance with Part F of the building regulations as a minimum. This should ensure that stale air is removed and fresh air is provided to keep your home healthy. In the scenarios outlined in this report we suggest upgrades to ventilation systems where appropriate. A simple assessment of your existing ventilation system is set out below.

2.2.1 Existing Ventilation System

The ventilation system in your home at present is: Unplanned Ventilation (Window Opening Only).

There is not evidence of an adequate supply of fresh air through planned intake vents such as trickle

vents in walls and/or windows or a mechanical supply system.

Ventilation systems need routes for both supply and extract air. Supply air could be supplied by a ducted mechanical system, or via adequately sized trickle vents in windows and walls. Lack of a route for supply air may mean there is an under-supply of fresh air into your home.

There is provision for purge ventilation in each habitable room (for example by opening windows or by a 'boost' on a mechanical ventilation system).

There is a clear undercut/overcut of 10mm above or below internal doors to allow air to move through the dwelling.

In addition if condensation and mould growth is noted in section 2.1.4 above, this suggests that the existing ventilation system is inadequate.

Given the above information we would suggest that your current ventilation system **Adequate for the current condition but will need to be upgraded as part of retrofit.**

2.2.2 Solid Fuel Appliances

If you have an appliance in your home that creates heat by burning oil, gas, coal or wood it needs proper ventilation to ensure that it burns cleanly. This can take the form of a dedicated supply air vent or duct, or a fixed vent in the wall. We would recommend that all fuel burning appliances should be serviced on a regular basis by qualified professionals (HETAS or Gas Safe) to ensure they are safe and properly ventilated. If you are improving the air-tightness through draught-proofing and insulation work this will become even more important to avoid the risk of carbon monoxide poisoning.

When we visited your home we noticed that you did have a fuel burning appliance. Hardly ever used because does not provide heat. no visible air supply, may contribute to poor performance.

In all cases where there is a fuel burning appliance in your home you should fit a carbon monoxide alarm near this appliance. You should also **ensure that any ventilation provided to the appliance is kept clear of obstructions.**

We generally do not recommend installing new room wood-burners or other fuel burning appliances as part of energy efficiency works. This is for several reasons. The first is that the requirement for fixed ventilation conflicts with attempts to improve air-tightness. The second is that burning fuel causes air pollution. In urban areas where air quality is already poor, this can be especially harmful for the people who live there. Finally, burning wood and most other fuels creates carbon dioxide at the point of combustion.

2.2.3 Laundry

You told us you dry your laundry by:

bathroom has airer, and dry sheets over banister.

Drying clothes indoors releases a lot of water vapour into the air, which can have a severe negative impact on indoor air quality. Using an electric dryer is very energy intensive, so should be avoided wherever possible. Drying outside is the most energy efficient way, but in the UK's climate this is not always possible.

As part of your retrofit project you could improve the way you dry your clothes, for example by providing a dedicated drying space integrated with your heating and ventilation systems.

2.2.4 Radon

Radon is a naturally occurring gas that is a known carcinogen - that is it increases the risk of cancer. The risk of high levels of radon build-up within homes varies across the country, dependent on the local geology.

Your home is in an area where there is a less than 1% chance of high levels of radon in homes. This figure is taken from information provided by Public Health England - see www.ukradon.org for more information.

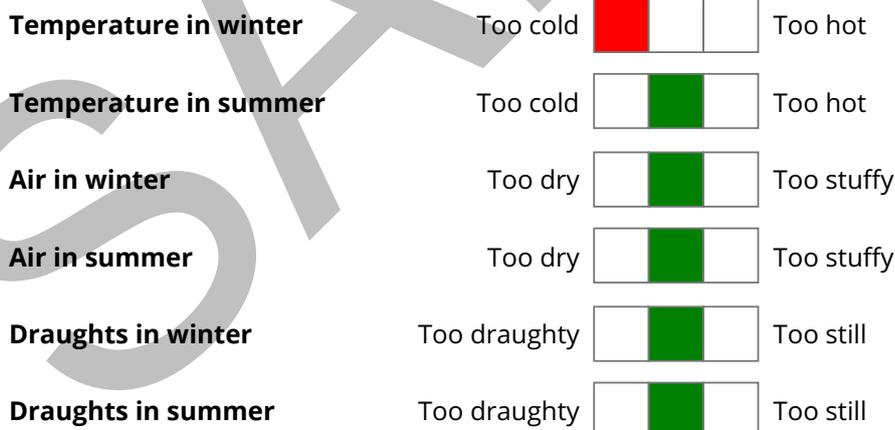
We would recommend that if you are planning works you obtain the individual report for your home, which is available for a small fee from here: https://www.ukradon.org/services/address_search. If your home is in a higher risk area, or just to provide further reassurance, you can also order a simple testing kit to test existing levels of radon in your home here: <https://www.ukradon.org/services/orderdomestic>

Where the risk of radon build up is higher adequate ventilation becomes even more important. It may also be necessary for you or your advisors to incorporate anti-radon measures into the designs for your home improvements, especially in the construction build-ups for floors. In some cases this may conflict with the need for air-tightness and may require careful consideration and detailing.

2.3 Your experience

Living in a home that is too cold, hot, damp, dry or draughty can affect your physical and mental wellbeing. It may trigger or worsen respiratory and cardiovascular problems, skin conditions, trips and falls, anxiety and depression. Understanding your perceptions of comfort allows us to tailor the reports recommendations with your comfort and health in mind. What you told us about your comfort is set out below:

2.3.1 Thermal comfort



You told us there were problem locations for thermal comfort.

During the day with heating off in winter generally too cold. With only one person in house prefer not to put heating on.

When we visited, the temperature was 18.15°C.

It is recommended that living spaces are at 16 o C as a minimum (World Health Organisation).

2.3.2 Daylight

Amount of daylight

Too little



Too much

You told us there were not problem locations for daylight.

2.3.3 Noise

You told us there were not problem locations for internal or external noise.

Assessor comments: have got used to noise from railway

2.3.4 General

Your favourite room?

Kitchen is where we do most of our living, centred around meals. Warmth is incidental.

Any rooms in your home you don't love?

The cellar is damp with RH often 99%

2.4 Historic signifiacnce

Many of the UK's homes are old and may be considered to have some historic significance. We consider this as part of the assessment because it may influence what is possible. In properties which are of particular historic significance the measures possible may be limited. Where buildings are listed or in a conservation area you may need to apply for permission to your local planning authority to make changes.

Property built: 1845

The property is in a conservation area.

2.5 Climate change adaption

2.5.1 Flood Risk

When planning the retrofit and refurbishment works for your home you should consider whether it is at increased risk of flooding. In areas of high risk you might choose to incorporate flood resilience or flood resistance measures as part of your retrofit. It may also affect which measures you choose to implement and how. For example, in an area with a high risk of flooding you might replace uninsulated timber ground floors with a solid insulated floor.

You told us that your home did not have a history of flooding.

Your home is in a very low risk area for flooding from rivers and the sea.

Your home is in a very low risk area for flooding from surface water.

Assessor comments:

Cellar has drainage features, owner has witnessed running water going through purpose designed,

What do the risk levels mean?

High risk	... means that each year this area has a chance of flooding of ...	greater than 3.3%
Medium risk		between 1% and 3.3%
Low risk		between 0.1% and 1%
Very low risk		less than 0.1%

This is based on flood map data available at <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>.

2.5.2 Overheating Risk

The UK's climate is changing, with summers becoming hotter. This means more of our homes are at risk of overheating. Improving insulation, air-tightness and ventilation in your home can reduce this risk, as it helps keep out heat during the day. However, if you have large areas of glazing and not much shade, especially if glazing faces East or West, your living spaces may become too hot from excess solar gains.

So shaded, solar gains likely to be small except conservatory

3 Scenarios

3.1 List of Scenarios

The scenarios we have developed in this report respond to your brief, the existing conditions of the property and the outcome of our modelling process.

We show the extent to which your home could be improved to make it more comfortable and sustainable in each scenario. We will always aim to suggest how you could make your home 'zero carbon ready' in at least one scenario.

We don't necessarily expect you to do all the work at once. The scenarios are intended to show you a pathway for you to achieve significant improvements using technologies and techniques that are currently available.

We have modelled the following scenarios:

- Scenario 1: First measures
- Scenario 2: A realistic target
- Scenario 3: How low can you go?

3.2 Scenario Comparisons

This section compares the performance of the proposed scenarios. We benchmark them against current UK averages and suggested 'zero carbon ready' targets. Where you have provided fuel bill information we have also compared them with your current energy use.

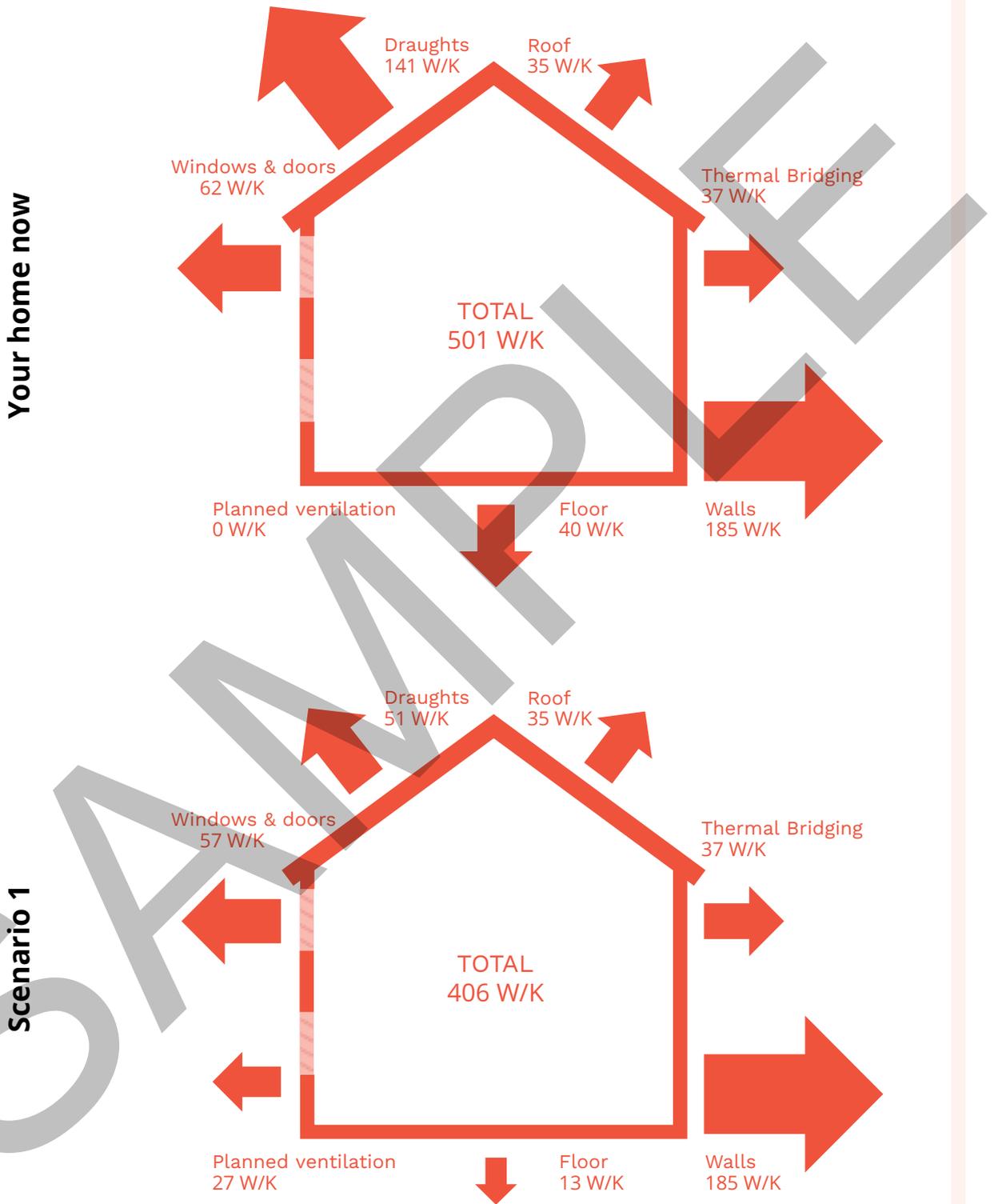
We model your home as assessed. We then modify this base model to test the effect of the measures proposed in each scenario. Further detailed comparison of the scenarios is provided in Appendix B.

3.2.1 Heat loss

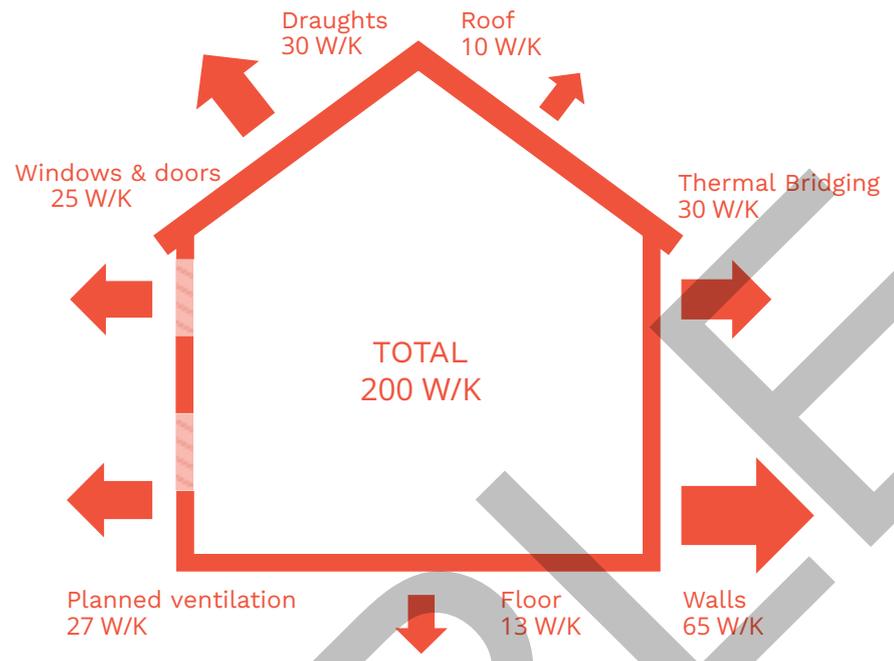
Space heating is the biggest use of energy in most UK homes. When it is colder outside your home continuously loses heat through the walls, floor, roof and windows to the external environment. The better insulated your home the slower this heat loss happens, so the less energy is needed to keep your home warm.

Your home also loses heat through draughts and ventilation. Warm air leaves your home through gaps in the building fabric – or intentionally through windows or fans. This rate of heat loss depends on how draughty your home is and its ventilation system. Figure 3 compares the relative heat loss of each element across your home now and the scenarios. It is measured in watts per degree Kelvin (W/K). This is the rate of heat loss for every degree of temperature difference between inside and outside.

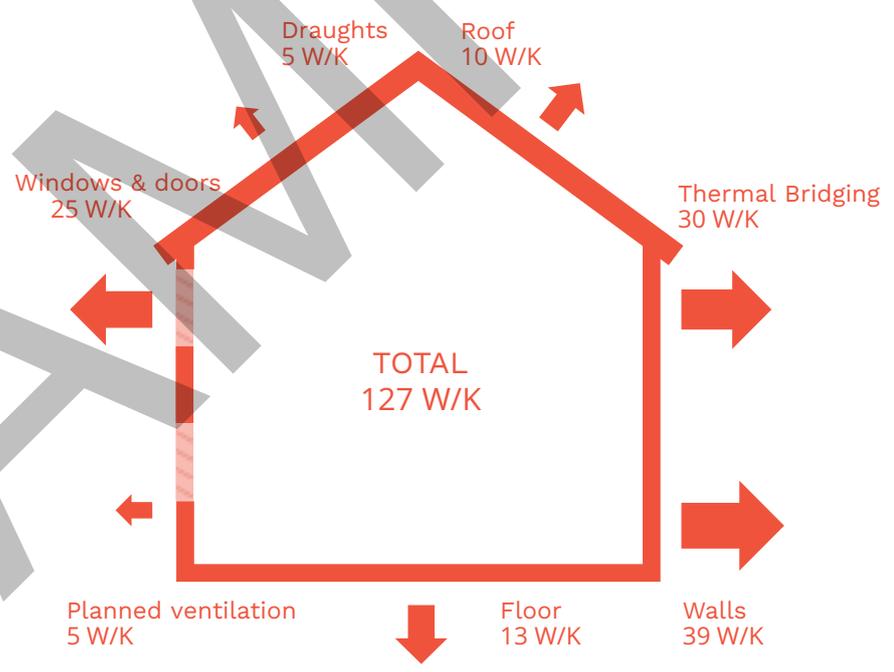
Figure 3. Heat Loss Summary



Scenario 2



Scenario 3



3.2.2 Peak Heat Load

Peak heat load is an indicator of the heating power needed to maintain a comfortable temperature in your home on the coldest days of the year. It is important because it should be used to inform the design of your space heating system. An oversized heating system, capable of providing more heat than you need, will be inefficient. In contrast, an under-sized heating system will struggle to keep your home warm.

A lower peak heating load is a very positive thing. As well as reducing the total amount of energy you need for space heating, it also means that you can achieve a comfortable temperature in your home with a system that runs at a lower temperature. This may improve the efficiency of a condensing boiler system. It also means that heat-pump based systems will perform much better.

Figure 4. Peak heating load calculations

	As is	Scenario 1	Scenario 2	Scenario 3
Heat loss per degree of heat difference	501 W/K	406 W/K	200 W/K	127 W/K
	×	×	×	×
Maximum temperature difference expected between inside and outside*	26°C †	26°C †	26°C †	26°C †
	=	=	=	=
Peak heating load	13.02 kW	10.55 kW	5.2 kW	3.31 kW
	÷	÷	÷	÷
Floor area	133 m ²	133 m ²	133 m ²	133 m ²
	=	=	=	=
Peaking heating load per square metre	98 W/m²	79 W/m²	39 W/m²	25 W/m²

* Lowest external temperature assumed to be -5°C

† 1°C = 1K (Kelvin)

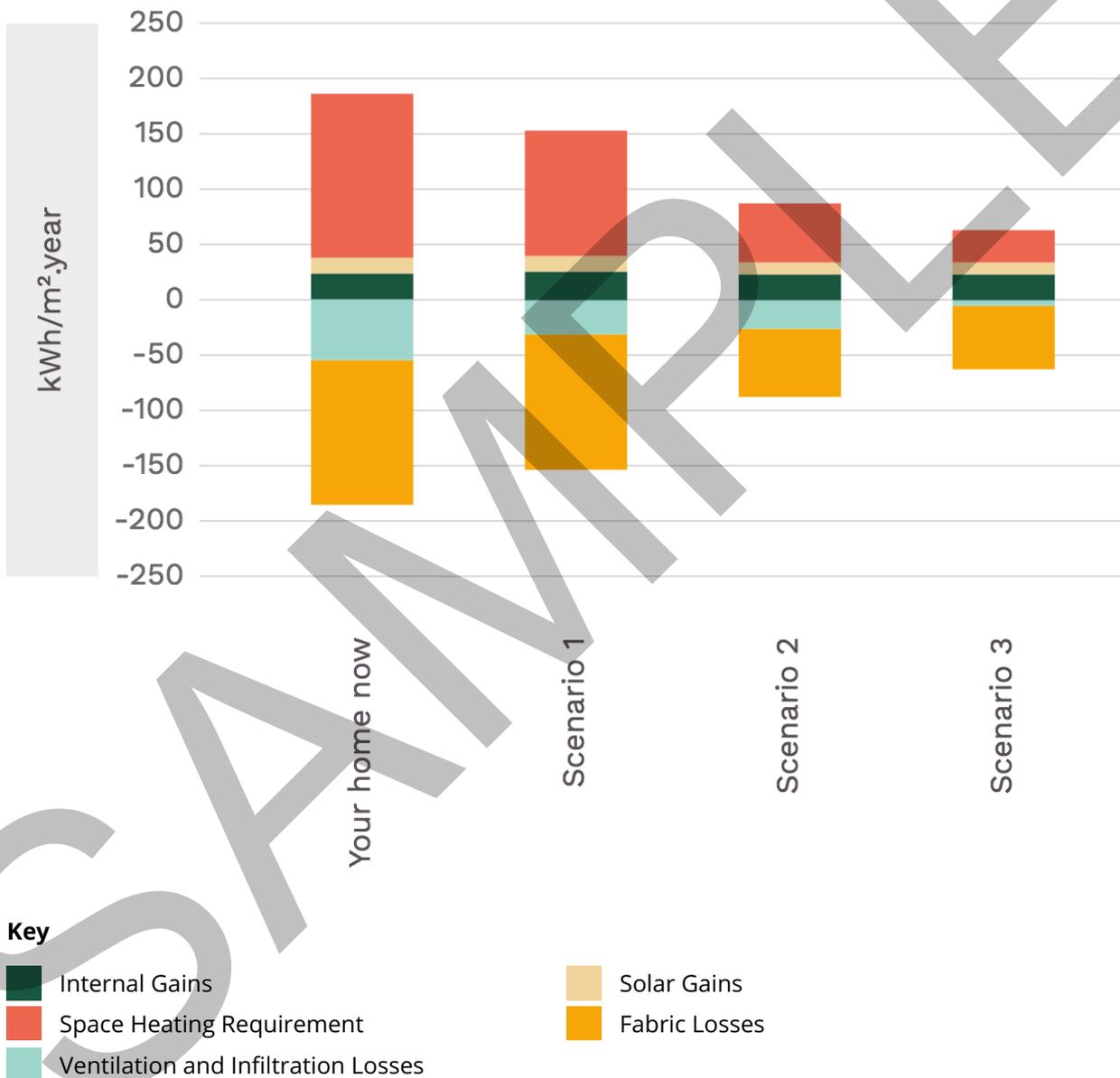
The figure provided here is approximate and intended to be used only as a rough guide. If you are planning to install a new heating system your designer should carry out a more detailed room-by-room heat loss calculation to more accurately inform system design.

3.2.3 Heat balance

Heat losses are balanced by the heat generated by you and activities in your home, such as cooking - known as 'internal gains'. Heat is also typically topped up by sunlight entering your home - known as

'solar gain'. The absolute contribution that both solar and internal gains make to heating your home will go down as you make improvements. This is because more efficient appliances, lighting and hot water systems reduce internal gains and better glazing in windows reduces the amount of solar gain. However, as you improve the rest of the fabric, the proportion both of these contribute to your space heating may go up, reducing the energy needed from your home's heating system to keep warm. Figure 4 shows this balance for your home in each of the scenarios in this report.

Figure 5. Your home's heat balance (kWh/m²-year)



3.2.4 Space heating demand

The gap between heat losses and heat gains in your home needs to be bridged by your heating system to keep your home warm. The amount of energy needed to do this is known as 'Space Heating Demand'. It takes into account the heat loss and heat gain factors described above. It is also affected by you

heating controls, how long you heat your home for, and the target temperature (room thermostat setting). It does not cover any other energy uses, such as lighting, hot water or energy used for fans, pumps and appliances.

Space Heating Demand is affected by the shape and volume of your home. If your home is complicated, or has a large exposed surface area compared to its floor area, its Space Heating Demand will be higher. For example a complicated detached house will usually have a higher space heating demand than an apartment with only one or two external walls. This is true even if they are built with similar materials and levels of insulation.

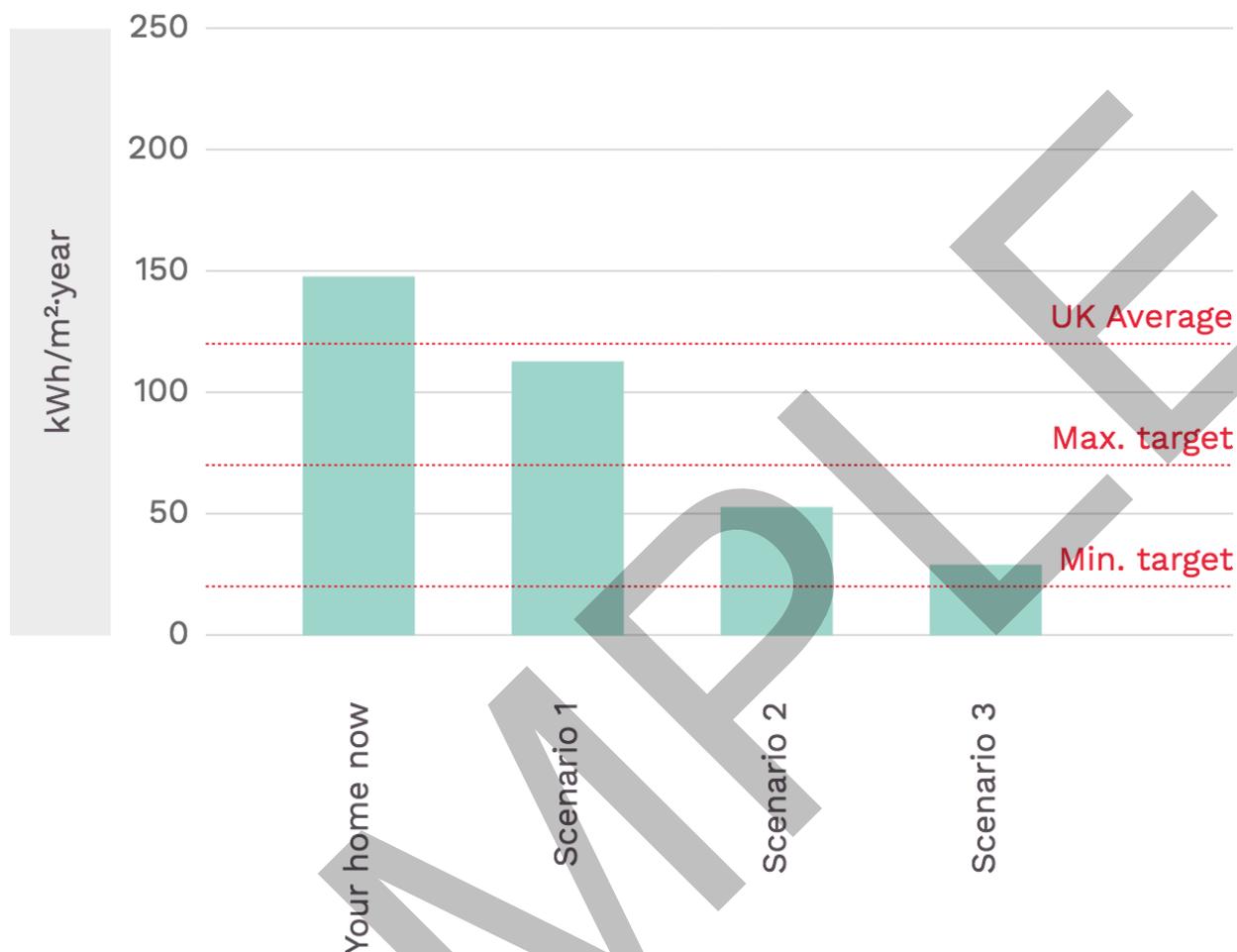
Improving the levels of insulation and draught-proofing of your home will reduce the Space Heating Demand. The lower the 'Space Heating Demand', the more efficient your home is. Homes with lower Space Heating Demand are easier to keep warm and retain heat for longer. This should make you more comfortable and reduce the risk of condensation and damp.

We have used the information you gave us during the survey about how often and for how long you heat your home and for your thermostat setting to inform our model. If the current thermostat setting is below 18°C, we have increased it in the retrofit models to 18°C as a minimum, and in some cases to 20°C. (You can check this in the scenario comparisons in Appendix B). We do this because we believe that health is as important as saving energy. 18°C is generally recommended as a healthy minimum temperature setting.

By taking this approach the scenarios assume that some 'comfort take back' is likely to occur. You could of course choose to improve your home's fabric efficiency and keep your thermostat setting low. This might well produce greater savings. However, you should be mindful that there may be consequences for your health and comfort. It may also increase the risk of surface condensation within your home.

The graph below shows the modelled Space Heating Demand of your home compared to the scenarios we have created. It is benchmarked against the UK average for all homes. We have also suggested a target range for the space heating demand that should be achieved to achieve good comfort and lower carbon emissions and fuel bills. Space Heating Demand is measured in kilowatt-hours per square metre of floor area per year. This is so that buildings of different sizes can be compared and benchmarked.

Figure 6. Space heating demand (kWh/m²-year)



3.2.5 Energy Use Intensity

Energy Use Intensity (Figure 7) shows the total energy used in your home, divided by the floor area of your home. It includes all uses: space heating, hot water, fans and pumps, lighting, appliances and cooking. We have shown this for your home as modelled as it exists now and for the suggested future scenarios. We have compared this against current energy use from your bills or monitoring where available.

It is measured in kilowatt hours per square metre of floor area meter per year (kWh/m²-year) to enable bench-marking and comparison between different buildings. To make your home 'zero carbon ready' this figure should be as low as possible. This is so that energy can easily be supplied from low carbon and renewable systems - either locally or from a decarbonised national electricity grid.

We have shown the proportion of energy by end use (as assumed in the model) by providing a stacked bar chart. This should help you to understand what the biggest uses are and how this might change in the future scenarios. (Please note: We are not able to provide accurate information about different end uses from your bill data, so this is shown as a single block).

Energy use in your home is influenced by both energy demand and by the efficiency of its heating, lighting, ventilation and other systems. Demand is in turn influenced by both the condition of the fabric and by the habits of its occupants. For example, in the case of space heating:

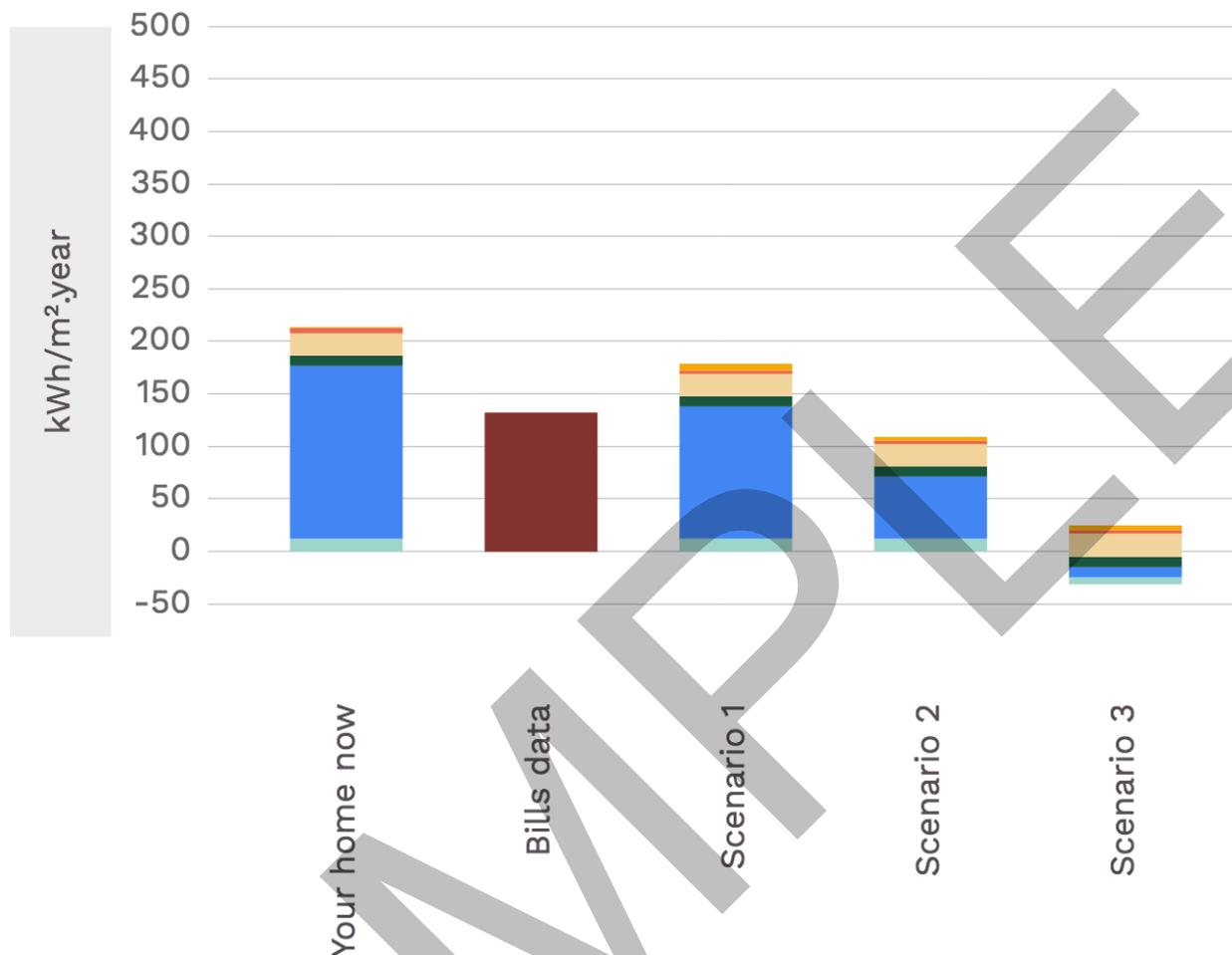
- an efficient building with a very inefficient heating system could result in higher energy use than expected;
- an efficient building with an efficient heating system could still result in higher than expected energy use if you keep it much warmer than normal for long periods;
- and a home with a very inefficient fabric and heating system could have much lower energy use than expected if the resident keeps it cold. (Though this is likely to be uncomfortable and unhealthy).

Your energy use is affected by a range of factors that we may not be able to account for fully in this model. For example, heat demand may change from year to year depending on changing weather patterns. Or your lifestyle may change so that you spend more time at home, need to do more laundry, stop using a dryer, or are away from home more often. Your energy use may go up or down dependent on all of these factors and many more. This graph is based on a model that cannot account for all of this complexity, though we aim to do our best in this respect. It is therefore a useful comparison between different scenarios, but not an absolute prediction of reality. (see 'Modelling Transparency' in the introduction to this report). It should also help you understand what the biggest uses of energy in your home are so you can target reducing them. However, it is sometimes less useful for making absolute predictions.

If you have existing on site electricity generation, such as solar photovoltaic panels, anything you generate and then use yourself will not be shown on your electricity bill. This is because you have not paid to import this electricity from the national grid. Your bill data might therefore suggest that your electricity usage is lower than in reality. Where import, export and generation of electricity is not metered separately, we have to make assumptions to give a more accurate representation of electricity use in your home from your bill data.

If you have an electric vehicle that you charge at home, we will seek to omit this from the above figures, so that they only relate to household energy use and not transport.

Figure 7. Energy Use Intensity (kWh/m²-year)



Key

- Water Heating
- Cooking
- Lighting
- Non categorized
- Space Heating
- Appliances
- Fans and Pumps

3.2.6 Fuel Use

Using the same data as the graph for 'energy use intensity', Figure 8 shows the fuels used rather than end uses, as total kilowatt hours (kWh) per year. It is not 'normalised' by floor area. It is not benchmarked against other buildings or national targets.

Understanding what amount of different fuels you use is important. To make our homes zero carbon we need to stop using fossil fuels like coal, gas and oil. To eliminate carbon dioxide emissions and tackle air pollution we need to stop burning fuels. This includes burning biomass or wood as fuel, as these also emit carbon dioxide and harmful pollution.

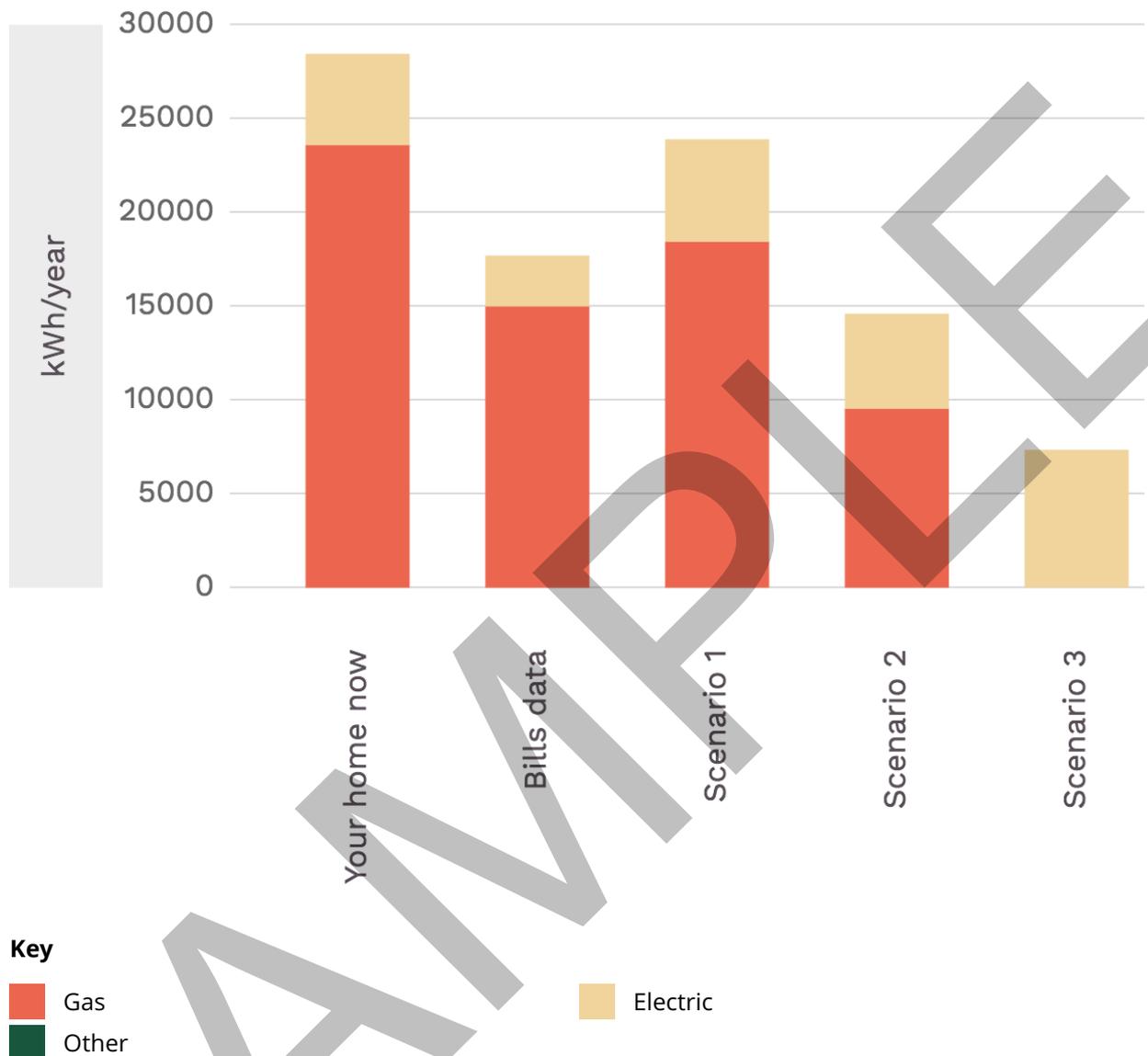
As the national grid decarbonises it becomes possible to consider electricity as a low-carbon fuel. Five years ago electricity was twice as carbon intensive as natural gas. It now produces a similar amount of carbon dioxide per kilowatt hour (kWh). Electricity is likely to continue to improve as more renewable energy capacity is installed. In contrast, fossil fuels like natural gas will remain as carbon intensive as they are now. We have taken this into account in the scenarios. We focus on future-proofing your home to be 'zero carbon ready' using existing technology.

Removing fossil for solid fuel heating systems is often easier to do once demand has been reduced. This is because you need less energy overall and so can use a more expensive fuel like electricity but still affordably heat your home because the total amount you need has been reduced. It also means you can install a system that works better at lower system temperatures, such as a heat pump. Depending on your circumstances and existing fuel sources, we might suggest this at an earlier stage of your retrofit journey.

Our assessor has made some recommendations on this as part of the scenarios set out in this report. The total energy use and fuel mix for each of the suggested scenarios is shown in the graph below.

SAMPLE

Figure 8. Fuel use in your home (kWh/year)



3.2.7 Carbon dioxide emissions

It is difficult to be certain of the carbon emissions that result from energy use in our homes. This is because it depends upon the generation energy mix in the national grid. This mix changes hourly, daily and seasonally and is also changing over time, as more renewable generation is added. This is one of the reasons why we concentrate on the energy use that is directly measurable in your home in this report.

However, we understand that it may be both useful and interesting to have some idea of the carbon emissions that result from energy use in your home. We have therefore applied an average 'carbon factor' to each of the fuels used in your home to create the graph below. This is the carbon intensity of the energy used, measured in kilograms of carbon dioxide per kilowatt hour of fuel used (kgCO₂/kWh).

For gas, electricity and most other fuels these figures are published by the government and updated

from time to time as change occurs in the system. They are a projected future average over 15 years, the assumed lifetime of the average heating system.

We have chosen to deviate from the official government figures for wood and biomass use. These are based on the best available evidence for the carbon emissions that result at the point these fuels are burned. They don't take into account future offsetting of these carbon emissions by the absorption of this carbon by new growth as we cannot be certain that this will happen and that it will be 'additional' to what would have happened anyway.

Note that any electricity 'generation' measures, such as solar panels, are also assigned a carbon factor. This is so that we can account for the electricity that you use directly from these sources at home, displacing grid electricity.

The carbon factors used in this report are as follows:

- Fuel Type 1: Standard Tariff, 0.136 kgCO₂/kWh
- Fuel Type 2: Mains Gas, 0.21 kgCO₂/kWh
- Fuel Type 3: generation, 0.136 kgCO₂/kWh

Figure 9 shows the approximate carbon dioxide emissions from the fuel used in your home. This is measured in kilograms per square metre of floor area per year. We have shown your home now and compared this to the scenarios proposed in this report. We've benchmarked this against the UK average. The ultimate aim is to ensure that your home can become truly zero carbon. This will not really be possible until the mains electricity grid is zero carbon. There is some uncertainty about when this may happen, but we know it is possible, if demand is reduced and controlled well.

Figure 9: Carbon dioxide emissions (KgCO₂/m².year)

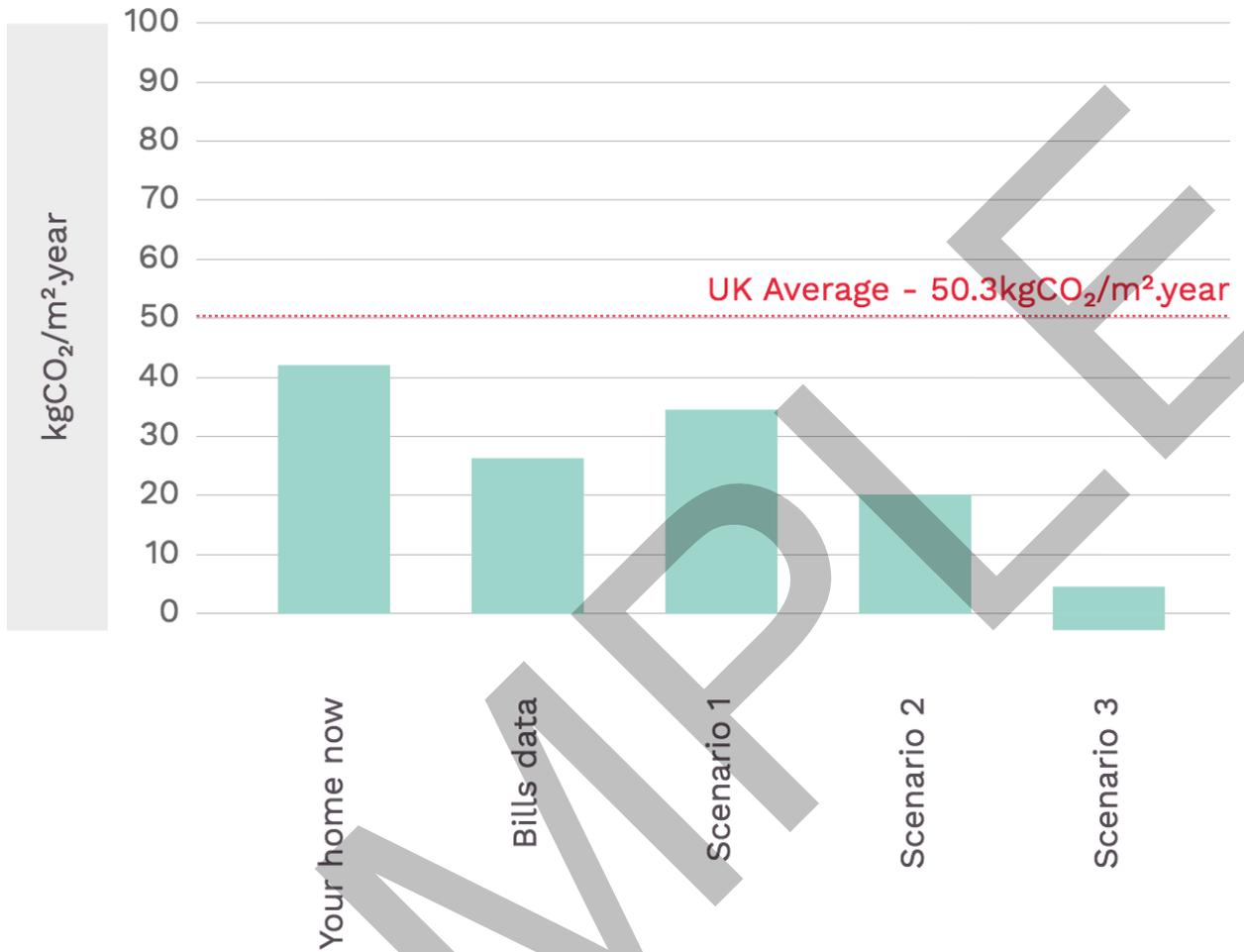
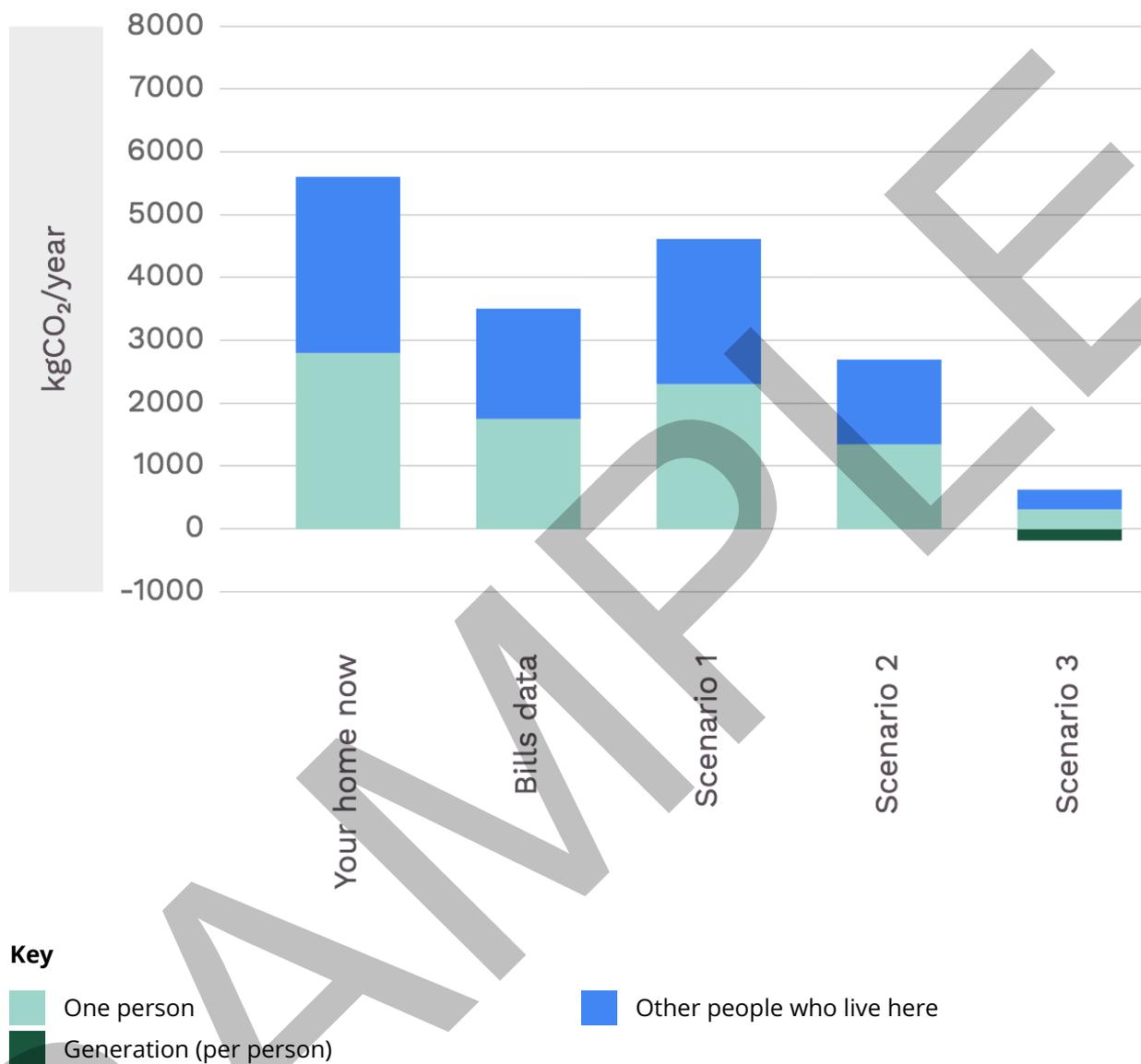


Figure 10 shows this same information on a per person basis rather than per square metre. This is in effect your personal carbon footprint associated with energy use in your home, measured in kilograms per person per year (kg/person). It is based on the actual number of people you told us live in your home.

Figure 10: Carbon dioxide emissions in kilograms per person per year (your personal carbon footprint)



3.2.8 Fuel costs

Reducing the amount of energy you need to run your home can reduce the amount you spend on fuel. The thermal performance of the building fabric, the efficiency of services, your patterns of use, the type of fuel and your tariff will all affect this. Improvements to building fabric and services will reduce costs – or at least improve comfort, whilst not increasing costs. The amount of energy needed for cooking and appliances is more dependent on your behaviour. This means that alongside physical retrofit measures you can maximise cost savings by being aware of how you use energy in your home. Straight forward changes like reducing the amount you use an electric clothes dryer can produce big savings.

Figure 11 shows the estimated annual cost of fuel for your home now and your retrofitted home as modelled. It also shows your current annual energy costs from bill data, if you provided this. We have

used standard fuel unit costs per kWh, based on national averages. This allows clearer comparison across scenarios and time, rather than being reliant on short-term offers from energy companies or seasonal variations in the unit cost of energy. We have set out the assumed unit prices below:

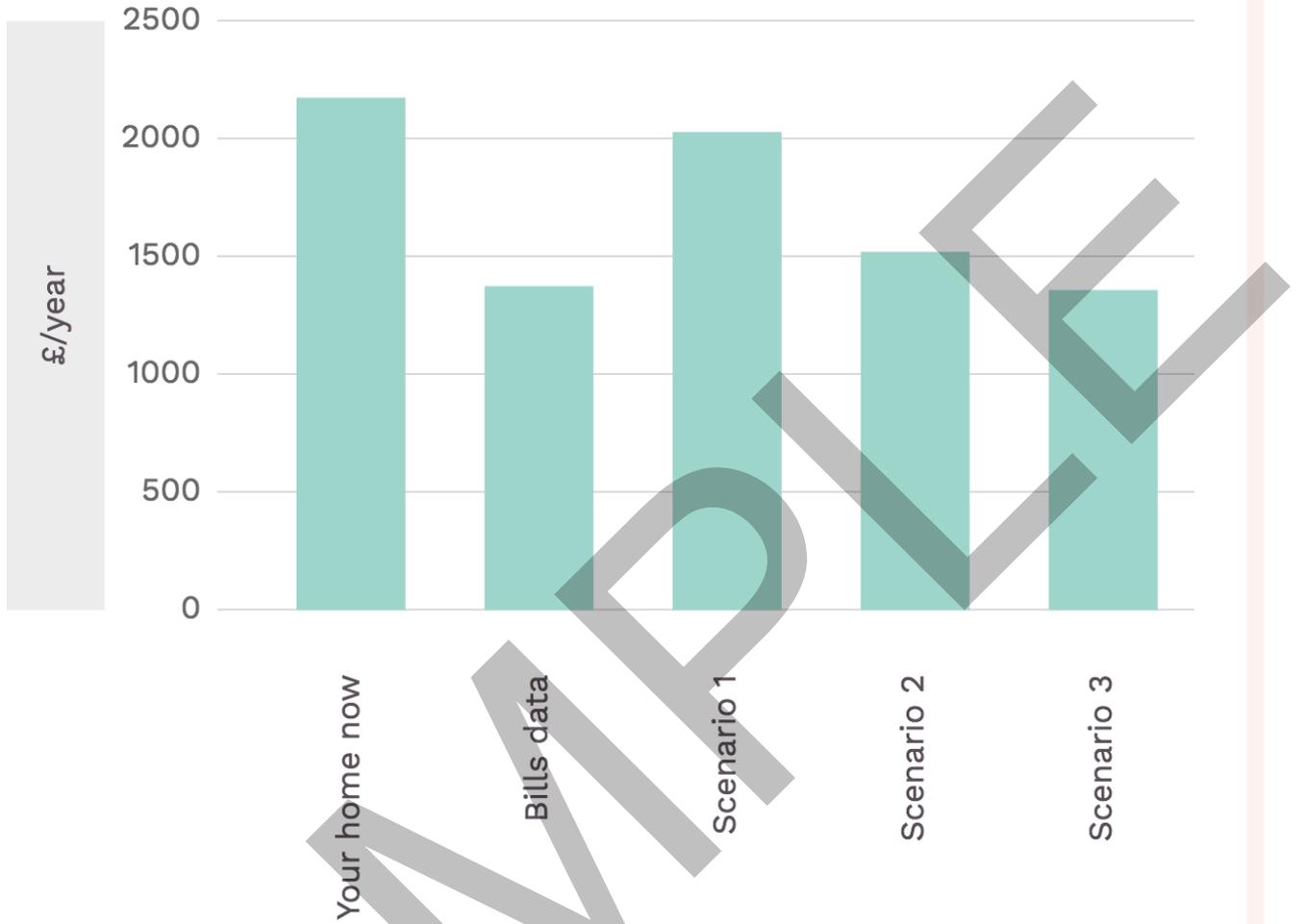
- Fuel Type 1: Standard Tariff, £0.18/kWh, standing charge £0.72
- Fuel Type 2: Mains Gas, £0.05/kWh, standing charge £0.88
- Fuel Type 3: generation, £0/kWh, no standing charge

If you have on-site energy sources, such as solar panels, we have included the savings from some of their energy being used directly in your home. We have estimated this in accordance with the figures given at Figure 7 in section 3.2.5 above. Figure 11 shows the estimated savings due to the onsite use of renewables as negative values.

You can maximise your savings from on-site renewables by using as much energy as possible yourself. This may require a change in your household's habits. Things like using your washing machine only when it's sunny, or using a slow cooker to make use of daytime electricity for your evening meal, can all contribute.

We have not included Feed-in-Tariffs (FITs), the Smart Export Guarantee (SEG) or the renewable heat incentive (RHI) in these figures. The rules around these payments vary over time and between suppliers. We therefore believe this information is more robust if these assumptions are not included.

Figure 11: Estimated fuel Costs (£/year)



Please note: models work on assumptions and there are many reasons why your actual current and future energy use may be different to what is shown above. See the introduction to this report and the methodology section in the appendix for more information.

4 Suggested Measures

4.1 Scenarios

As noted in section 3 above, we have mapped out 3 scenarios for your home retrofit:

- Scenario 1: First measures
- Scenario 2: A realistic target
- Scenario 3: How low can you go?

In this section we provide more detail of what is involved in each of these scenarios. We have also included a commentary from your assessor that gives more specific information where appropriate. Further detailed information about each of the proposed measures is available in Appendix A.

SAMPLE

4.2 Summary of measures

Figure 13a - Scenario 1: First measures

Total cost of the scenario £9920

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
High Performance Double-Glazed Window	WW1-Kitch-offshot	1.2 W/m2.K	Comfort Carbon Emissions Fuel Bills	£465.00	General Contractor/ Window Fitter	HIGH
Insulated part Glazed External Door	D1 Kitchen	1.1 W/m2.K	Comfort Carbon Emissions Fuel Bills	£2370.00	General Contractor/ Joiner	MEDIUM
Insulation to suspended timber floor (c.175mm)	FL1 Main floor approx average	0.2 W/m2.K	Comfort Carbon Emissions Fuel Bills	£4390.00	DIY/General Contractor	MEDIUM/HIGH (depending on access)
Cap and Fill Chimney	Whole house		Comfort, fuel bills, carbon.	£1050.00	General Contractor	MEDIUM
Advanced Draughtproofing	Whole house	Air permeability approx 7.5 m ³ /m ² .hr50pa	comfort, fuel bills, carbon.	£600.00	DIY/ General Contractor	MEDIUM
Decentralised Mechanical Extract Ventilation (dMEV)	Whole house	Minimum Building Regulations - Part F	Indoor air quality, reducing the risk of condensation and mould	£750.00	Qualified Electrician.	MINIMAL
Advanced Central Controls	Whole house	--	Fuel Bills, carbon Emissions, Comfort	£250.00	Specialist Installer	MINIMAL

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
Low Energy Lights	Whole house	100 lumens/watt minimum	Carbon, Fuel Bills, Lighting Quality.	£44.00	DIY	LOW

SAMPLE

Figure 13b - Scenario 2: A realistic target

This scenario assumes the measures in Scenario 1 have already been carried out and adds to them

Total cost of the scenario £38360

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
IWI to solid masonry wall (c.25mm)	W1- Front - N	0.8 W/m2.K	Comfort, Carbon Emissions, Fuel Bills	£3970.00	Specialist Installer	HIGH
EWI to solid masonry wall (c.170-200mm thick)	W2- Endl - E	0.2 W/m2.K	Comfort, Carbon Emissions, Fuel Bills	£7932.98	Specialist Installer	HIGH
IWI to solid masonry wall (c.25mm)	W3 - Rear - S	0.8 W/m2.K	Comfort, Carbon Emissions, Fuel Bills	£4190.00	Specialist Installer	HIGH
IWI to solid masonry wall (c.25mm)	W4 - Rear to Conserve- S	0.8 W/m2.K	Comfort, Carbon Emissions, Fuel Bills	£720.00	Specialist Installer	HIGH
Insulation to timber frame wall to unheated space (c.100mm insulation)	W5 - Attic side walls - Both	0.3 W/m2.K	Comfort Carbon Emissions Fuel Bills	£1200.00	DIY or General Contractor	MEDIUM
Triple Glazed Rooflight	RL1-Attic	1.2 W/m2.K	Daylight Comfort Carbon Emissions Fuel Bills summer ventilation	£760.00	Window Fitter/ Joiner	MEDIUM

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
Triple Glazed Rooflight	RL2 Attic	1.2 W/m2.K	Daylight Comfort Carbon Emissions Fuel Bills summer ventilation	£1030.00	Window Fitter/ Joiner	MEDIUM
Insulated Solid External Door	D2 Front	1.1 W/m2.K	Comfort Carbon Emissions Fuel Bills	£1600.00	General Contractor/ Joiner	MEDIUM
Insulation to timber frame wall to unheated space (c.100mm insulation)	W6 - Staircase and sides	0.3 W/m2.K	Comfort Carbon Emissions Fuel Bills	£680.00	DIY or General Contractor	MEDIUM
175mm insulation at rafters to pitched roof	RF1 Attic slope	0.25 W/m2.K	Comfort Carbon Emissions Fuel Bills	£4564.00	Roofing Contractor/ General Contractor/ DIY	HIGH
Top up loft insulation	RF2 Ceilings	0.11 W/m2.K	Fuel Bills Carbon Emissions Comfort	£454.00	DIY or General Contractor	MINIMAL
High Performance Triple Glazed Window	Various	0.9 W/m2.K	Comfort Carbon Emissions Fuel Bills	£8263.50	General Contractor/ Window Fitter	HIGH
Advanced air-tightness Works	Whole house	Air-permeability - 3m ³ /m ² .hr50pa	Comfort, fuel bills, carbon.	£1500.00	General Contractor	HIGH

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
High Quality Whole House Mechanical Extract Ventilation (MEV)	Whole house	Detailed system specification required.	Indoor air quality, reducing risk of condensation and mould	£1500.00	Qualified Electrician	MEDIUM

SAMPLE

Figure 13c - Scenario 3: How low can you go?

This scenario assumes the measures in Scenario 2 have already been carried out and adds to them

Total cost of the scenario £33620

Name	Label/location	Performance target	Benefits (in order)	Cost	Completed By	Disruption
IWI to solid masonry wall (c.80mm)	Various	0.4 W/m ² .K	Comfort, Carbon Emissions, Fuel Bills	£10987.50	Specialist Installer	HIGH
Remove Chimney	Whole house	n/a	Comfort, fuel bills, carbon.	£4000.00	General Contractor	HIGH
Very Advanced air-tightness	Whole house	Air permeability < 1m ³ /m ² .hr50pa	comfort, fuel bills, carbon.	£2500.00	General Contractor	HIGH
High Quality Mechanical Ventilation with Heat Recovery (MVHR)	Whole house	Detailed system specification required.	Indoor air quality, reducing risk of condensation and mould	£5000.00	Specialist Installer	HIGH
High Quality Air Source Heat Pump (ASHP)	Whole house	SPF of 3.1 or more	Carbon Emissions, Fuel Costs	£4500.00	MCS accredited installer	MEDIUM
Solar Photovoltaic Panels - Large System	Whole house	3.9kWp	Reduced Carbon Emissions, Fuel Cost Savings	£6630.00	Specialist Installer MCS accredited.	MEDIUM

4.3 Table headings

In addition to listing and describing proposed measures, we use the following table headings to guide you through our recommendations.

4.3.1 Performance target

This is the standard that needs to be achieved to match the assumptions in the model. For a wall, floor, window or roof this is usually a measure of its thermal performance and insulation value. This is known as a U-value and measured in watts per square meter of building envelope area per degree Kelvin - $W/m_2.K$. For a heating system it will be its efficiency. It is important to reference this when looking at detailed specifications. If this report recommends 200mm of high quality insulation this is what is required to achieve the scenario outcomes shown above. The same effect won't be achieved with 100mm of lower quality insulation.

4.3.2 Benefits

We understand that you may wish to carry out retrofit works for reasons other than energy and cost savings – such as comfort improvements, improved indoor air quality or carbon emissions reductions. It's important that in planning the work you understand and communicate your priorities to any professionals or builders you're working with. Carbon Co-op can help you understand and explore these issues – please see Section 3.0 of this report for more details of how we can help.

The relative impact of each measure will vary depending on the order you do them in. For example, if you change your boiler before installing insulation, the absolute savings from the insulation work will be less than if you had installed the insulation first.

4.3.3 How much?

We have provided some rough cost information for each of the measures suggested. It is an approximation so that you can begin to plan a budget for your project. It is not a fixed cost or quote. It is based on generic cost information from published industry data, informed by our experience.

Cost rates in your project may vary significantly from those suggested here. This is dependent on a number of factors including: the construction market at the time you carry out the works; inflation in labour and material prices; the scale of the work; the specifications, standards and level of finish you request; the contractor you choose and their overheads, experience, capacity and attitude to risk.

Estimated budget costs suggested here **do not include**:

- **Contingency:** Any refurbishment project is likely to encounter unforeseen issues that mean you need to spend more money than planned. Careful planning and investigation before carrying out the work will help reduce the risks - but it is impossible to eliminate this risk altogether. It is therefore sensible to include a contingency sum in your project planning. You can then hold back this money and use it to pay for unplanned parts of the work. Around 10% of the construction cost is a standard amount to allow. This may be higher or lower depending on your confidence in the likely works and your own attitude towards risk. If you are more risk averse, a bigger contingency is advisable. If you are able to carry more risk, you may choose to hold a smaller contingency.
- **Preliminaries:** These are the costs for management and supplementary works associated with building work. They include things like scaffolding or the services of a site manager. These costs will vary dependent on the scale and complexity of the work and the contractors and procurement route chosen. Bigger contractors and bigger or more complex works that take longer will tend to carry higher preliminaries. The positive side of this is that it creates greater management capacity. Small and simple works carried out by micro-businesses or DIY may have very limited preliminary costs. We would suggest 10% is a sensible budget cost, but this should be adjusted according to your particular circumstances.

- **Professional fees:** You may need to engage designers and advisors on your project, for example an architect, engineer, quantity surveyor or energy specialist. This is in addition to paying contractors to carry out the work. They can help you in a number of different ways including:

- developing your initial brief into a concept design
- testing the proposed designs against your requirements
- Preparing a construction cost plan for your project
- applying for planning permission or meeting other statutory requirements
- developing detailed technical designs for the whole project or specialist elements
- assisting with procurement
- preparing contract and legal documents
- providing advice and contract management services during and after construction

The costs for this will vary according to the amount of work involved in your project. It will also be influenced by the skills and experience of your advisor and the way the fee is calculated (whether a fixed fee, a time charge, or a percentage of the construction costs). In the initial planning stage a budget cost of 10-20% would be sensible to assume for professional fees in most cases - but you should try to work this out in detail.

- **Statutory fees:** These include fees for planning permission, listed building consent or building control approval. You may not need planning permission for the works you propose. However most building works will require building control approval, and this should be allowed for. You can find out the normal rates for planning and building control fees from your local authority.
- **VAT:** We have not included VAT (Value Added Tax). This is because the rate may vary depending on government policy and the way that you procure the works. Discount VAT are available for some works - consult HMRC for more information. If you make assumptions about VAT in your project planning, you should make this clear to your contractor as they may be required to take action themselves or inform their accountant and HMRC.
- **Inflation:** Budget costs are based on current information. Costs will increase over time. This is true both for construction work and for professional and statutory fees. We cannot be certain of when you will carry out any of the works suggested, so cannot allow for this. Construction price inflation is also difficult to predict. It is highly sensitive to things like currency fluctuations and changes in the workforce.
- **Relocation costs:** We have not included any costs associated with you moving out of your home while construction work takes place. You should think carefully about whether this will be necessary for you. You might choose to move out for a short while during the most disruptive parts of the work, or for a longer period if works are extensive. You should build this into your cost plan. Think carefully about what will happen if works take longer than planned and consider whether you need a contingency for this.
- **Redecoration costs:** We have not included costs for the redecoration work. This is because this could vary significantly between households. It depends on whether you choose to do the work yourself, or pay someone else to do it. It also depends on the level of finish and the materials you choose.

Major works:

If you are planning major work we recommend that you or your advisors prepare a detailed cost plan. This should include costs for the construction work and all of the items outlined above. It should be up to date, and use quotes from suppliers where possible. In the planning phase of your project this will enable you to make better decisions about what to prioritise. When it comes to choosing a contractor, it will enable you to compare the quotes against this estimate.

Smaller works:

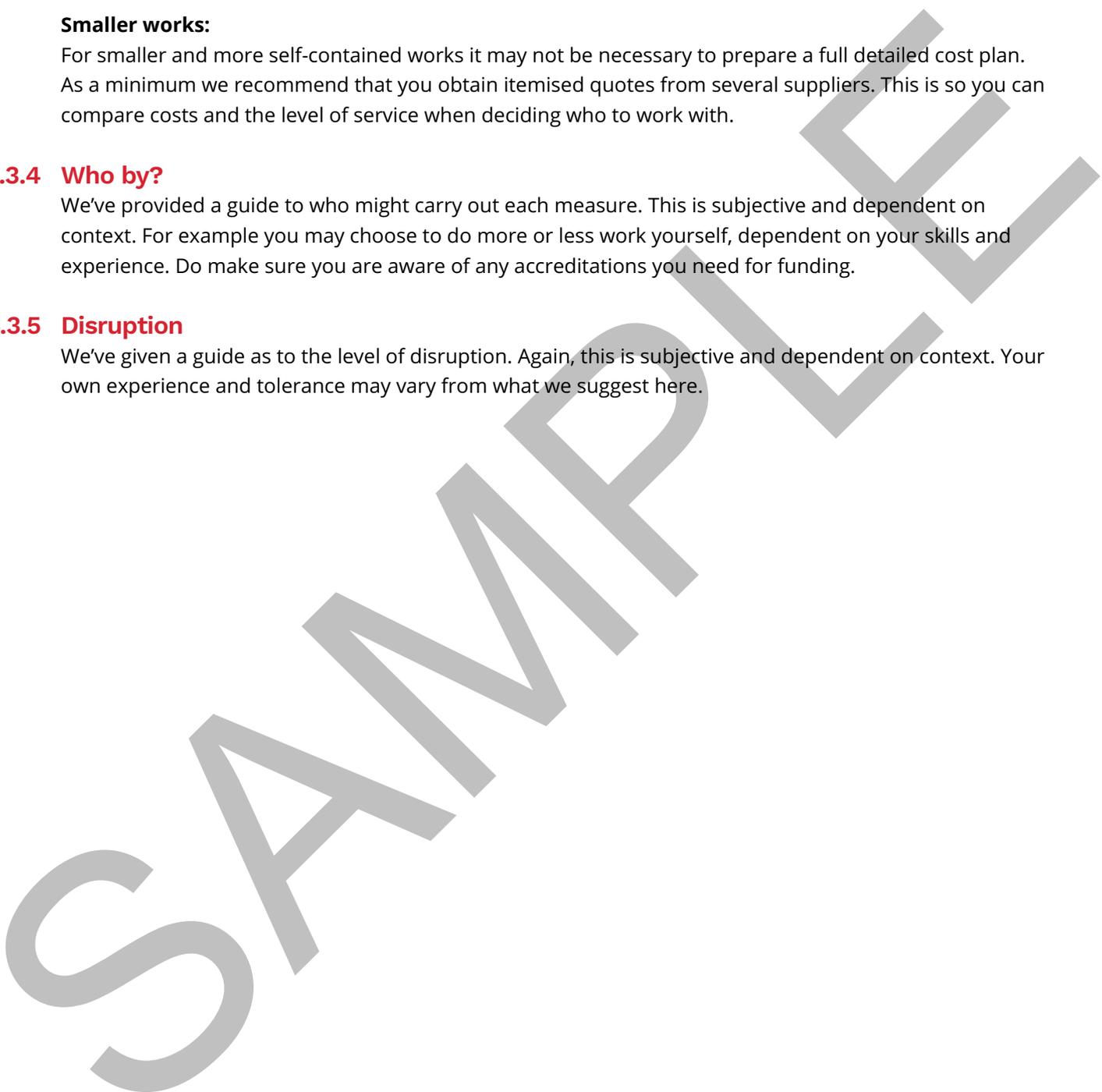
For smaller and more self-contained works it may not be necessary to prepare a full detailed cost plan. As a minimum we recommend that you obtain itemised quotes from several suppliers. This is so you can compare costs and the level of service when deciding who to work with.

4.3.4 Who by?

We've provided a guide to who might carry out each measure. This is subjective and dependent on context. For example you may choose to do more or less work yourself, dependent on your skills and experience. Do make sure you are aware of any accreditations you need for funding.

4.3.5 Disruption

We've given a guide as to the level of disruption. Again, this is subjective and dependent on context. Your own experience and tolerance may vary from what we suggest here.



4.4 Assessor Commentary

4.4.1 Current context + logic of scenarios

Your property is an early Victoria end of terrace clearly of some architectural interest.

The terraces are grouped into 3s and interlock with each other in an unusual way.

The property is split over 4 levels but the cellar is unheated. The heated space totals 133m² of floor area. The walls are of solid brick. The ground floor is above a cellar which extends across the whole property. Due to damp problems in the cellar you had extra ventilation put in and someone fitted PIR insulation between the joists which you noted has improved comfort in some rooms. However, this was done in a way that means cold air can still pass between insulation effectively bypassing it. This is particularly noticeable in the front room where draughts can be felt through knot holes in the floor boards. The floor insulation needs redoing.

The windows are a mix of single and double glazed timber with some uPVC double glazed. All are of an age that could be replaced.

The attic was converted at some point. You were told when you purchased that this did not meet building regulations, presumably due to staircase. It's also unclear what levels of insulation are in the roof and walls. We have made some assumptions here based on the visible dimensions.

The mains gas combi boiler is of good quality and efficiency. However, the thermostat is old and does not function well overshooting in both directions.

There is an unheated conservatory at the rear of the property. This does get very hot in summer.

The property is surrounded by mature trees and as such is quite heavily over shaded.

Currently ventilation is mostly provided unintentionally via gaps, cracks and chimney stacks. The fan in the bathroom does not work, likewise the kitchen cooker hood is of doubtful use.

You have a mix of low energy and incandescent bulbs in the house.

Bills show that you use approximately 15000kWh of gas and 2700kWh of electricity per annum.

A model of your property suggests that you would use quite a lot more than this so probably many areas of the house are kept cooler. The model shows the space heating demand is about 148 kWh/m² of floor area which is, as is to be expected for a property of this type) well above the UK average of 120 kWh/m².

Carbon dioxide emissions are predicted to be 51kg/m² which is the UK average.

As such we have compiled 3 scenarios

In scenario 1 we do some small tasks that should be easy to manage.

In scenario 2 we suggest the farthest it might be reasonable for you personally to take your property. You may not choose to do all of this but it shows what is possible.

In scenario 3 we propose the full extent of what could be done to your home in trying to get it to zero carbon

4.4.2 Scenario 1: First measures

First we suggest that the floor is redone. The insulation that is there can be reused but needs removing, more adding and membranes to address air tightness to the floor.

Here we suggest you carry out some intensive draught-proofing measures. This includes the floor as above, sealing around windows and doors.

Additionally we suggest you cap and fill those chimneys which you do not use, keeping the wood burning stove which will need its own dedicated air supply. This could come from a duct through the floor into the cellar that comes up near to the stove to avoid draughts in the rest of the room.

Installing fans in the bathroom and kitchen will ensure adequate ventilation of the property.

Replace the single glazed kitchen window and the kitchen door with high quality replacements.

The boiler is very sound but as you are aware the controls are not. Getting a good quality programmer and room stat will improve comfort and efficiency.

Finally here we suggest you fit low energy bulbs in all the light fittings which do not have them.

These measures could see the space heating demand drop to 113 kWh/m² and carbon emissions to 44

kgCO₂/m²

4.4.3 Scenario 2: A realistic target

Although you stated that you do not expect to alter the external appearance of your property we have suggested you externally insulate the end (east) wall as we feel it can be done without altering the appearance much from its current state.

The other external walls we suggest insulating internally but with only a modest thickness. This will make it easier to retain the features. You should also be able to do this one room at a time.

You can easily insulate the walls of the route down to the cellar. The walls and roof of the attic may be more tricky as you will need to get behind the walls somehow. Whilst in there the loft space behind can be topped up.

In this scenario all the windows, and roof-lights are replaced with high performance triple glazed units.

The front door and cellar door can also be replaced with insulated ones.

If done properly these measures should provide a much higher level of airtightness. We therefore suggest a central mechanical extract system that is one fan doing both kitchen and bathroom continuously at a low level. You will need to provide supply air to each room either via trickle vents in the windows or airbricks in the walls.

These measures could make the energy space heat demand and carbon emissions 53 kWh/m² and 28 kgCO₂/m² respectively. This represents significant improvement from the existing situation.

4.4.4 Scenario 3: How low can you go?

In this final scenario we suggest things that you may not wish to do because they would cause a great deal of disruption and likely affect the appearance of your property internally.

Using a thicker level of internal insulation

Adding a balanced heat recovery ventilation system (this will preclude the need for additional vents in the walls/windows).

Removing all the chimneys altogether.

Further improving airtightness by stripping the internal fabric right back before rebuilding.

When the boiler has reached the end of its life replacing it with an air source heat pump will significantly reduce the amount of energy required to heat your home and hot water. However, this is a measure that should only be considered when a very high level of performance has been achieved in the fabric of the property. There may be an issue with planning for this in a conservation area which should be checked. It may be possible to house the unit in the garage,

Finally adding a PV system to both the east and west facing roof.

These measures would see space heat demand fall to 29 kWh/m² which is almost an 80% reduction from the current situation. Carbon emissions could drop to 5kgCO₂/m². This is below the old 80% by 2050 target the government was signed up to.

4.4.5 Key decisions to be made, risks and constraints, and areas for further investigation and development

Whether to internally insulate or not. Consider external insulation of gable end.

What to do about attic. Redoing in entirety if still required. Or revert to loft space.

5 Next Steps

5.1 Process

There is no one-size-fits-all solution to carrying out a retrofit project. Some people employ professionals to oversee all their improvements; others carry out the work in whole or in part on a DIY basis. Some achieve everything at once in a 'big project'; others work in stages, incrementally over years.

5.1.1 Quick Wins

There are some simple things you can do that require little planning that will make an immediate difference. We don't make recommendations about these in this report as they are relatively simple. If you would like further information or advice on any of them please do get in touch. These might include:

Energy Efficient Appliances:

Replace old appliances - like fridges and freezers - with more efficient versions as they wear out.

Heating Controls:

Spend some time properly understanding the controls for your existing heating and ventilation systems, so that you are using these systems effectively and efficiently.

Monitoring:

Spend some time monitoring your existing energy use in more detail, so that you understand where energy is going and can potentially reduce it through changes in your patterns of use.

Ventilation:

Make sure your home's existing ventilation system is in good order. Clean out dusty extract fans and make sure windows are openable and not painted shut.

Basic maintenance:

Check and clean gutters and rainwater downpipes so water goes where it is meant to rather than making your walls wet and cold. Check and unblock air-bricks that provide ventilation below suspended timber floors and check ventilation paths in your attic or cold loft space.

5.1.2 Getting Your Home 'Retrofit Ready'

Before you carry out retrofit improvements to your home you and/or your advisors should fully understand its existing condition. You should make sure it is sound and well maintained before adding any insulation, improving air-tightness or making other major alterations like new windows or heating systems.

We have included some basic relevant information about your property above. If you are considering major works you may wish to carry out more detailed survey work. In particular you should check things like the condition of any existing cavity wall insulation and rainwater drainage. You should address any issues associated with water ingress, condensation or damp. These issues should either be rectified before any retrofit work is done. Or a plan for their rectification should be included in your detailed retrofit plan.

5.1.3 Making Some Decisions

This report is intended to help you understand your home's current condition, clarify your retrofit project aims, and understand the potential for retrofit works. Now you have an idea of what improvements could make, you need to make some decisions about what work you will do. You will also need to consider timescale, budget, and who might do the work.

5.1.4 Time, Cost, Quality

All building projects face three main constraints: time, cost and quality. In a given only two of these can be the focus. Quality is important in retrofit to avoid the performance gap and achieve your desired outcomes. This means that your project can either be delivered quickly at expense, or cheaply given more time. You should try to be clear about where your priorities lie in relation to Time, Cost and Quality. It is crucial in understanding and articulating your aims. It will also help you devise your retrofit pathway. For example, if you have the money but not time you are likely to rely more on professionals than if you have more time but less money.

5.1.5 Developing designs

The improvements suggested in this report aren't in a form that you can simply be hand to a builder to do. As we make clear, this report is not a detailed construction plan or design proposal. It is not suitable for use as construction information. The information should be checked by others before carrying out the detailed design and construction work. You may need to involve a designer or specialist contractor to help you with this. They can develop design information for the work you want to do, so you are clear about your plans. Once you have detailed proposals you will be ready to start work.

5.1.6 Getting the work done

It is important to choose contractors who understand the work you want to do. They should be happy to take a 'whole house' approach that pays attention to risks in retrofit. They should understand the need for quality control and be willing to work with you to achieve a good outcome. The type of contractor you need will vary depending on the scope, scale and the nature of work you want to do. You might work with a small local contractor for some parts, or a specialist retrofit firm for others. If you are working with an architect or designer, they may recommend a contractor they have worked with before. Or may choose to work with a company that can offer combined Design and Build services. Finding the right contractor for the job may take time but in the long run it's worth getting right. You may want to contact a number of companies for quotes. Your shortlist could be informed by recommendations from friends, neighbours or personal experience, as well as from advisors. Whatever route you take it's worth getting written confirmation of what you've agreed your contractor will do. Ideally this should be in the form of a standard contract that is well understood by everyone involved.

5.1.7 Monitoring and evaluating

It's essential to evaluate the impact your retrofit project has had on your home. Evaluation helps you to understand the impact of the changes you have made. It can help spot any errors and improve future work, should it be necessary. This means looking back at your original aims once the work is done to see if they were achieved. For example, you can check whether your energy utility bills have changed. Or you may wish to reflect on whether you are more comfortable. Going further you can track internal temperature and other environmental data. Checking the quality of the work by carrying out air-pressure tests and taking thermal images can be very valuable. This can be done at completion - or just before all the work is complete, pick up on problems before everything is finished.

5.2 Support: How can Carbon Co-op help?

Carbon Co-op is a community benefit society made up of like-minded members, individuals taking practical action to reduce their use of home energy. We can help you progress your retrofit project in a number of ways.

Seminars and training: retrofit seminars and events, ranging from introductory sessions to more advanced workshops. Led by industry professionals, our seminars provide specialist information and

enable householders to access trusted, independent expertise.

Green Open Homes weekends: meet householders who have carried out improvements and regularly open their homes to the general public over a weekend. It's a great way to understand just what is involved in a whole house retrofit, exchange contacts and to become aware of some of the common pitfalls to avoid. Keep an eye on the Carbon Co-op website for details of upcoming events.

Factsheets and case studies: available through our website, factsheets and case studies give key information about a particular area of expertise within retrofit.

Socials: We host socials, opportunities for members to meet, network and swap experiences. These events, often held in a cafe or pub, feature short presentations or skill-share sessions from members, followed by informal networking with food and drink laid on.

Bulk discount offers: Our members benefit from collective purchasing power. Where a common need can be identified, Carbon Co-op can negotiate a bulk discount scheme with suppliers or installers. Past deals include energy monitors, triple glazed windows, car share schemes and LED lightbulbs.

Heat Camera and boroscope: Carbon Co-op have a thermal imaging camera and boroscope that can be lent to members.

5.2.1 People Powered Retrofit

In partnership with URBED, we offer services for householders to help you deliver their retrofit projects. Under People Powered Retrofit we can offer assistance in making key decisions, co-ordinating contractor procurement, overseeing retrofit works quality assurance and ongoing advice and hand-holding.

For more information and a detailed quote get in touch with us on 0161 820 1273 or via hello@retrofit.coop

Appendices

A Scenario Measures Complete Tables

Scenario 1: First measures

Total cost of the scenario £9920

Measure:

Label/location:

Description:

*THESE PAGES PROVIDE MORE
DETAILED GUIDANCE ON EACH OF
THE SUGGESTED
MEASURES.....CONTINUES FOR
SEVERAL PAGES.*

Associated work:

Maintenance:

Special and other considerations:

Who by:

Key risks:

Dirt and disruption:

Benefits:

Performance target:

Cost per unit

Minimum cost

Total cost

B Detailed scenario comparison

Based on the survey we completed of your home, and the results generated using My Home Energy Planner, here we provide comparisons across fabric condition, heating and hot water systems, ventilation, lighting, appliances and cooking, and renewables.

Figure 15a Master/Scenario 1 Comparison Table Ventilation

*THESE PAGES PROVIDE A
DETAILED COMPARIOSON OF
EACH OF THE SCENARIOS AGAINST
THE EXISTING CONDITION OF THE
PROPERTY.....CONTINUES FOR
SEVERAL PAGES.*

C Glossary

Retrofit and building efficiency have a language all of their own. In this report there may be words and concepts that are unfamiliar to you. If there is anything you don't understand, please ask us.

We believe in using the correct terminology wherever possible, so that when you speak to professionals and tradespeople involved in retrofit you are familiar with the terms. To help your understanding we have provided the short glossary of common words and phrases below.

AECB

The AECB (Association for Environment Conscious Building) is a network of individuals and companies with a common aim of promoting sustainable building. It is run by its members and is an independent, not for profit organisation. It publishes research and provides guidance and support on low energy building standards and water efficiency.

Air changes per hour (ACH)

This is usually used as a measure of ventilation. It is the rate at which the volume of air in a room or building changes. So a room that has 2 air changes per hour is ventilated twice as much as a room with 1 air change per hour. It is also used as a measure of air-tightness. See the definition below.

Air permeability

This is the volume of air that moves through a square metre of outside surface in an hour. It is a way of measuring how draughty your home is. This is usually stated as a certain number of metres cubed per hour per square metre of building surface area at a given pressure (usually 50 Pascals). It is written as $m^3/hr \cdot m^2@50pa$. This is sometimes called the q50 figure.

Air tightness

This is another way of measuring how draughty your home is. It is measured as the rate of change in the volume of air in the house in an hour at a given pressure (50 Pascals). It is written as 1 ACH@50pa. This is sometimes called the n50 figure.

Air Pressure Test (or “blower door test”)

This is a method for testing air permeability and air tightness. A fan is fixed to a door or window and used to change the air pressure in a building. The rate at which the fan has to work to achieve a certain pressure within the house is measured. This is used to calculate the air permeability and/or air tightness figures described above.

Comfort Take-Back (Rebound Effect)

This is where some of the benefits of energy efficiency improvements in your home are taken in greater comfort - so keeping your home warmer - rather than in using less fuel. The extent to which this occurs will depend on the preferences of your household. This is not necessarily a bad thing - if your home was very cold before, it will have health benefits if you're now able to keep your home warmer. This is also why in developing our scenarios we assume a reasonable internal temperature - and that your home will get warmer if it was cold before.

Fabric First

A 'fabric-first' approach to retrofit looks to make repairs and improvements to the building fabric before addressing building services or adding renewable generation. It is characterised by very good levels of insulation and air-tightness, paying close attention to minimising thermal bridging and air-tightness. However, it also means looking to fix some of the basics, like repointing brick walls and fixing guttering, before adding new measures.

Feed-in Tariff

This was a subsidy payment made on small scale renewable electricity generating installations like solar electric photo-voltaic panels. It pays a unit price per kilowatt hour generated. The scheme is now closed to new applicants, but systems that were registered on the scheme before April 2019 will continue to receive inflation-linked payments. It has been partially replaced by the 'Smart Export Guarantee'.

HMRC

Her Majesty's Revenue and Customs - otherwise known as the tax office.

K (degrees Kelvin)

The kelvin is the unit of temperature in the International System of Units (SI). It is commonly used in building physics calculations. 1 degree Kelvin is equivalent to 1 degree celsius/ centigrade (oC). However instead of the scale starting at the freezing point of water, it starts at 'absolute zero'. This is the coldest possible temperature in the universe (equivalent to -273°C).

Kilowatt-hour (kWh)

This is a unit of energy – a measure of the total amount of work done over a period of time. 1 kilowatt-hour would be used by a 1kW rated electric fire left on for one hour. A 100W (0.1kW) bulb left on for one hour would use 0.1kWh.

Microgeneration Certification Scheme (MCS)

This is a national standard for the certification of renewable and low-carbon products and installations. This includes things like solar photovoltaic panels and heat pumps. This provides some degree of assurance of the quality of an installation. It is a requirement for any installation for which you plan to claim things like the Renewable Heating Incentive (RHI).

PAS2035

PAS stands for Publicly Available Specification. These can be developed by any organisation, association or group who wish to document standardised best practice on a specific subject, both for the benefit of their industry and to help promote their expertise. However, it must be overseen by the BSI (British Standards Institute). PAS2035: 2018 covers the specification for the energy retrofit of domestic buildings.

Performance gap

This is the difference between intended outcomes at briefing and design stage and the built result. It is commonly used to refer to a failure to achieve projected energy savings. It can also relate to a range of outcomes including comfort and indoor air quality. It is the result of a range of factors that can occur throughout the design and building process. It can be mitigated by:

- sensible assumptions in design and modeling that properly consider the project brief
- care and attention to buildability in detailed design
- good quality control during construction

- an allowance for proper commissioning of systems on completion
- appropriate maintenance throughout the life of the building

Radon

Radon is a radioactive gas that can't be seen, smelt or tasted: you need special equipment to detect it. It comes from the rocks and soil found everywhere in the UK, though is more prevalent in some areas of the country. The radon level in the air we breathe outside is very low but can be higher inside buildings. The risk of radon build up can be reduced through good construction detailing and a properly designed ventilation system.

Regulated emissions

These are the energy uses and resulting carbon dioxide emissions that are covered by Building Regulations in the SAP rating (see below). These include the energy used to heat, light and ventilate your home and provide hot water.

RH (Relative Humidity)

Relative humidity (RH) is a measure of how saturated with moisture the air is: how close it is to reaching its maximum holding capacity. It is expressed as a percentage. When RH is at 100%, the air is saturated. It has reached 'dew point' - so any more water added to the air will condense into liquid form.

Renewable Heat Incentive (RHI)

The Renewable Heat Incentive is a subsidy payment for installations that generate heat, like heat pumps and biomass boilers. It pays a few pennies per kilowatt hour of heat generated. To qualify any system will need to be MCS (Micro-Generation Certification Scheme - see above) certified and meet a number of other criteria. It is likely that the scheme will end or at least change significantly in 2021, so you may wish to bear this in mind when planning works.

Retrofit

New houses can be built to a very high level of energy efficiency. Older houses, built when our expectations of comfort were much lower and when energy was cheaper, tend to perform very poorly in terms of energy efficiency, carbon emissions and comfort. These homes therefore need to be augmented with energy saving measures – both in fabric and services - or renewable energy generating measures, to bring them up to a more acceptable standard. This process is known as retrofit, i.e. 'retrospectively fitting' measures to an existing property.

SAP

SAP is the Standard Assessment Procedure used to assess energy use in UK homes. The UK government devised SAP as a way to compare homes and test them against Building Regulations. SAP forms the basis of the energy model used in this report.

SAP makes assumptions about the number of people living in a home and how it is heated and used, based on averages for the UK. You may not be 'average' and may use your home in different ways. So, SAP is not an exact predictive tool.

In My Home Energy Planner we have taken SAP as our base calculation methodology and adapted it so that we can adjust some of the key assumptions.

SAP model

The SAP model is the tool used to calculate the energy and carbon performance of a home and produce its SAP rating. It uses a standard set of calculations, set out in publicly available documents.

SAP rating

Domestic buildings are given a SAP rating in the Building Regulations approval process for new-build homes. Energy Performance Certificates (EPCs) for sales and lettings of existing homes also include a SAP rating. The higher the SAP rating, the better the building is in terms of energy efficiency, carbon dioxide emissions and fuel costs.

The SAP rating is influenced by predicted energy use, carbon emissions and fuel costs. This means that the SAP rating is influenced by levels of insulation, how efficient your heating system and other services are, the type of fuel you use to heat and light your home, and whether you have any renewables. However, the SAP rating only covers regulated emissions. It does not cover appliances or cooking.

Smart Export Guarantee

The smart export guarantee (SEG) is a tariff paid to small-scale low-carbon generators for electricity exported to the National Grid. It's a replacement for the export element of the Feed In Tariff.

STBA

The Sustainable Traditional Buildings Alliance is a collaboration of organisations that acts as a forum for sustaining and improving traditional (solid wall) buildings. The STBA develops policy, guidance and training to minimise risks and maximise benefits to traditional buildings and their owners.

Thermal ('Cold') bridge

This is an area of the building where insulation is reduced compared to the surrounding building elements, meaning that heat flows at a higher rate through the 'bridge' created. It can be the result of the shape of the building at this point or missing insulation. This can cause cold spots on the inside building surface or within the structure. If the temperature at this point is low enough it creates a risk of surface condensation and mould growth. It should be avoided wherever possible through careful design.

Thermal imaging

This is the process of using a 'heat camera' or thermal imaging camera to look at buildings. Instead of using the visible light spectrum this uses infrared to 'see' heat. This allows you to see where heat is escaping from a building. You can do this from inside or outside the building. It can be very useful when used alongside an air pressure test as it enables you to 'see' draughts. It takes skill and experience to interpret images correctly - but is a very helpful tool in visualising heat loss.

Unregulated emissions

These are the energy uses and resulting carbon dioxide emissions that are not covered by Building Regulations. They are less directly related to the building fabric and include cooking and electrical appliance use. Appliance use covers laundry washing and drying, fridges and freezers, and consumer electricals such as TVs and computers.

U-value

This is a measure of the thermal performance of a building element. U-value is measured in watts per square metre per degree of temperature difference (measured in Kelvin). So, if a wall has a U-value of $1 \text{ W/m}^2 \cdot \text{K}$, it loses 1 watt per square metre of wall area per degree of difference between inside and outside. So, if it is 0°C outside and 20°C inside and the wall is 10 square metres, it would lose 200 watts of heat – equivalent to the power used by a set of hair-straighteners.

Vapour Open - Vapour Permeable and Hygroscopic (“Breathability”)

This has nothing to do with air or breathing. If a material is described as 'breathable' it actually refers to the behaviour of materials in relation to water vapour and moisture - so we prefer to use the terms vapour open or hygroscopic. This is about how easy it is for moisture to travel through a material. This can be by transfer in the air passing through small holes or pores in the material - known as vapour permeability. It can also be through capillary action in materials like timber, where moisture travels along small tubes in the material. Or absorption in materials like lime and clay (hygroscopicity).

It is an important consideration in retrofit, because older building materials are generally more vapour open than modern materials. This needs to be considered when suggesting changes to older buildings. Otherwise this risks the build up of damp, mould and condensation.

Watt

This is a unit of power – that is the rate at which work is done or energy is used. 1 watt is equivalent to 1 joule per second. A 100-watt lightbulb uses 100 joules per second. 1 kilowatt (kW) = 1000W.

Whole House Retrofit

This is a holistic approach to retrofit and energy efficiency work that considers the whole building as a system. It does not necessarily mean that all the work has to be done in one go. It does mean that the relationship between different measures and systems is considered. It also means that the risk of unintended consequences is considered and mitigated.

W/K - Watts per degree Kelvin (heat loss)

This is the rate at which heat is lost through a building element. It is measured in Watts per degree of temperature difference between inside and outside, in degrees Kelvin.

Zero Carbon / Net Zero Carbon

If a building or service is 'zero carbon' it results in no carbon dioxide emissions. Most often this can be qualified by 'in use' meaning that whilst it might have taken energy and resources to create - which result in carbon emissions - during its use phase there are no associated emissions. For example, this might be true of a wind turbine. Or in our case that the energy used by a house during its occupation does not result in carbon emissions.

Net Zero Carbon means that there are still some carbon emissions associated with the building or service - but these are offset in some way. This might be over time - so for example a house generates as much electricity as it uses in a year from solar panels, but still needs to use electricity from the national grid that has associated carbon emissions at times when the solar panels are not generating. Alternatively the home may use a fuel, such as a form of biomass, which in theory is 'zero carbon' because new biomass growth will absorb the resulting carbon emissions. However this is a carbon accounting minefield, and can lead to perverse incentives.

This is why we prefer the term 'Zero Carbon Ready'. By reducing the energy use in our homes we can make them ready for a time when the energy supplied to our homes is truly zero carbon - and help speed this along by reducing the amount of infrastructure investment required to achieve this.

SAMPLE

D Our Methodology

D.1 What We Do

Before the assessment:

When you request an assessment a retrofit advisor will speak to you to find out a little more about your home and your plans. At this point we will ask you to provide any documentation you have on your home - plans and drawings, estate agents details, approvals and certificates, Energy Performance Certificate (EPC) or any similar information.

This allows us to check that the assessment is suitable for your home and your project. It also allows us to match the best assessor to your home and gives them a chance to review some of this basic information before they visit.

We then arrange for them to visit your home to carry out a survey.

During the survey visit:

One of our assessors will visit your home to:

- Speak to you in more depth to better understand the context of your home and your plans, using our standard householder questionnaire as a set of prompts.
- Check with you whether there is any more information available about your home. This might include old planning and building regulations drawings, certificates for things that have been installed like windows and heating systems, or surveys and reports carried out as part of the sales and valuation process.
- Make observations about the construction of your home and how it is serviced. This will include basic construction information, a simple assessment of the ventilation system, and noting how your home is currently heated.
- Take a series of measurements of your home to input into the energy model, including all windows.

PLEASE NOTE: This report is based on a survey of your home at a fixed point in time. If changes are made after our assessor visits, the modelling and recommendations set out in this report may no longer be relevant. You should take this into account when making plans for your retrofit.

After the visit:

Our assessors will:

- Review all the information available on your home. This will include the answers you gave to the questionnaire, their survey notes and measurements and any other relevant information.
- Use the My Home Energy Planner tool to create a baseline energy model for your home. This will be compared with any bill data you were able to provide on current energy use and gives a starting point for the creation.
- Duplicate the baseline energy model and adapt it to create three scenarios for improvement in your home.
- Provide some notes on the scenarios and any relevant context.

- Generate the My Home Energy Planner Report as a PDF and issue this to you.

If you are planning to alter or extend your home and have provided enough information on this, the baseline model and/or the scenario models may include this. The assessor will make this clear in the notes on your report. This will necessarily include a number of assumptions that should be checked as your plans develop. Please note that the approximate average costs will not include costs for alteration and extension works. These should be costed separately by you or your advisors.

After the report is issued:

Once you have received the report we will give you some time to digest it. One of our advisors will then be in touch to see whether you have any questions or need any further guidance or support. As part of the service we offer up to a 30 minute chat or short exchange of emails with your assessor to enable clarification.

D.2 Modelling and Assumptions

My Home Energy Planner is a bespoke modelling tool, based on the full version of the 'Standard Assessment Procedure' (SAP). This is the UK's national methodology for calculating the energy performance of domestic buildings. This model is a useful representation that allows different approaches to be compared. – it does not produce guaranteed absolute predictions and should not be treated as doing so.

My Home Energy Planner and SAP are based on a similar 'steady state' heat loss model. This calculates the average annual heat loss from your home, and consequently the amount of energy needed to heat it from your heating system. Alongside this there are separate but related calculations for energy use from lighting, appliances, cooking and other building services.

My Home Energy Planner is based on a number of key variables and associated assumptions. We have adopted some of these and adapted others as described below.

Climate:

We use the standard SAP climate data for the region of the UK that your home is in. These assumptions may not prove true in any given year. So if there is a colder winter than average your home may use more energy than predicted here.

Occupancy:

We use the actual number of people who live in your home in our calculations. This is in place of assumption based on floor area that SAP generates. This should help make the model more accurate.

Heating Target Temperature:

When calculating heating demand, SAP assumes a temperature of 21°C in your living area. We deliberately deviate from this. In the baseline model we use your current target temperature for your heating system, if this is known. This is the temperature your thermostat is normally set at. If this is not known we assume an average target temperature in the existing condition of 20°C - though we may adjust this if we have reason to believe it is actually much higher or lower. In the future scenarios we will generally use a target temperature of 20°C, even if at the moment you generally keep your home cooler. This allows for some 'comfort take back' to occur. Even if you prefer your home to be cooler than this. Generally we would never assume an internal

temperature of less than 18oC - this is to ensure the model is set at a level which is generally agreed to be healthy.

Heating Period:

SAP would normally assume a standard number of hours for the heating system to be on in your home. In My Home Energy Planner we adjust this to more closely reflect how you live in your home, based on information you provided us with.

Existing Construction Information

When carrying out a standard SAP assessment for regulatory compliance the assessor must assume the worst for any element of the construction unless they have official documentation. So for example, unless they have certificates from installers and good photographic evidence they cannot assume that an existing inaccessible floor is insulated. This is so that buildings cannot 'pass' the regulations without proper checks. A My Home Energy Planner assessment is carried out for a different purpose - that is to help you make decisions about future improvements to your home. For that reason we are less prescriptive about the evidence we require for some elements. This means that if you know that an inaccessible part of the structure was insulated - like a roof or floor - and can provide us with some details, we can include these in our modelling assumptions. This should enable a greater degree of accuracy and avoids the risk of exaggerating potential savings by assuming that your home performs at the moment than in reality.

Chimneys and Flues

The standard assumptions in SAP for heat loss from vents and flues has been shown by recent research to be conservative. We have therefore used the figures from this research in their place.

Appliances and Cooking

We use a bespoke calculation for energy use from appliances and cooking that takes into account the actual appliances you own, rather than making standard assumptions based on floor area. We include the result from this in the overall results from My Home Energy Planner - so that it covers the total energy use of your home, not just those parts covered by the building regulations. We don't make recommendations about improvements to appliances in the model - so any savings you are able to make by improving the efficiency of appliances as you replace them will be in addition to those outlined in this report (unless you have a stove that contributes to heating).

Carbon Factors

Different fuels have different average annual rates of carbon emissions associated with them. This is changing quite rapidly as the national electricity grid decarbonises. We aim to use the latest recognised carbon factors in our modelling - and these are stated in the report above.

Cost of Fuel

We use standard assumptions for the costs of different fuels in our modelling. This is because it is more appropriate in this report to concentrate on the performance of the building and its services than any current deal you have with your energy provider (which in any case is likely to change over time). This enables simpler comparison over time and between properties.

Suggested Measures

Whilst changing the physical properties of your home, as suggested in this report, should make a positive contribution towards energy saving, the actual amount of energy saved will vary. It will depend on how you use your home, the order in which the works are done, and how closely they

match the assumptions made in this report. Measures related to building services are more difficult to predict. For example, the use of electrical appliances, hot water and cooking varies significantly between households and over time. Similarly the savings available from improved heating and ventilation systems will depend on the quality of their installation, commissioning, control systems and maintenance.

SAMPLE