Whole House Plan

Our ref: [redacted]
Address: [redacted]
Survey date: 18/01/2023
Report date: 03/02/2023
Retrofit Coordinator: [redacted]

YOUR HOME BETTER

Contents

1. Introduction

Your Home Better is an independent retrofit delivery service. We support homeowners to make their home better by improving comfort and reduce energy bills and carbon emissions associated with home energy use and heating.

As energy prices soar and security of supply becomes increasingly volatile, carrying out home retrofit can put yourself back in control of your own energy use and supply. This can be done by installing insulation, new heating systems or solar panels that can generate renewable energy.

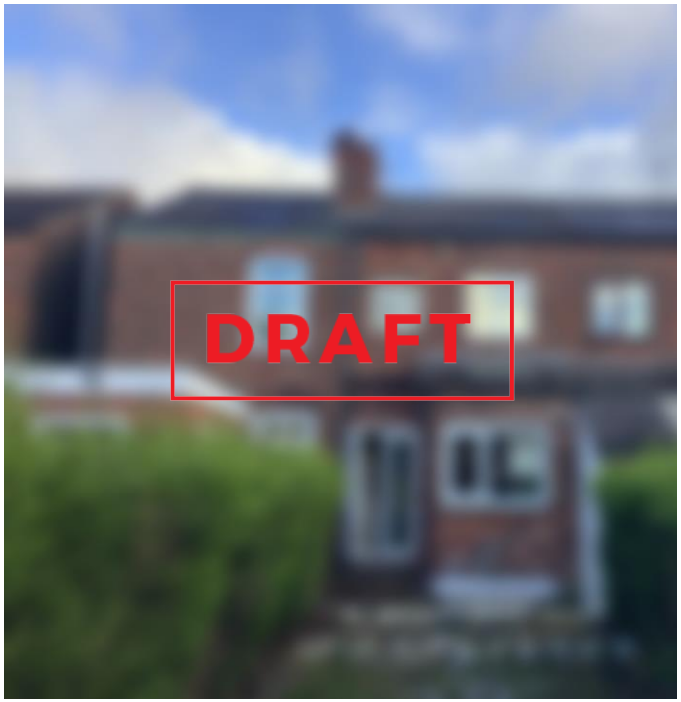
Your Home Better is a collaboration between various organisations linked with Greater Manchester all working towards finding ways to deliver retrofit now and innovate to make retrofits even better in the future. Our collaboration is led by the cooperative RetrofitWorks and is supported by the Greater Manchester Combined Authority.

This Whole House Plan is the first step in our service and is made in a way we hope will enable you to select those retrofit measures that are best for you and your home at this point in time. It is based on information gathered during an assessment of your home and identifies various retrofit measures that can be suitable to install to make your home better. It also advices on the order these can be installed in by grouping them in different phases as well as calculating the estimated effect they can have on your fuel bill and carbon emissions.

We hope this plan will enable you to select those measures that suit your needs.

2. Methodology

We assess your home using the nationally accepted methodology for calculations that underpins the Energy Performance Certificate (EPC) regime for all UK homes, but we don't rely entirely on its calculations. We have updated your estimated fuel bills to reflect recent changes to the price cap as well as updating estimated carbon emissions to match the most recent government projections on how much carbon emissions different types of energy emits. We also don't rely on the standard recommendations of measures from the EPC regime, but instead look at your property to ensure that the measures are suitable.



Caveats

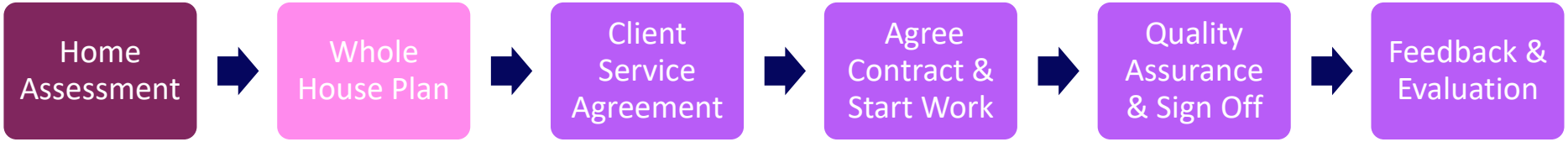
The costs in this plan are indicative. They are the current best estimate we have for specific measures and are subject to change. They are not quotations and do not include preliminaries and professional fees such as scaffolding and architectural services as these cannot be estimated at this stage. Some measures are also likely to require significant redecoration and due to the significant differences in personal requirements for each home, we are unable to estimate the costs of redecoration.

Inflation

Budget costs as based on current information and market prices at the time of writing. The cost of your work may increase due to inflation. Inflation within the construction industry is difficult to predict as it is extremely sensitive to currency fluctuation, workforce, material costs and availability.

3. The retrofit journey

Let's set up a 30-min consultation to discuss your Whole House Plan. If you require more advice or research of questions you may have, you can agree to pay an hourly rate of £60 incl. VAT for additional time spent by one of our retrofit coordinators.



Client Service Agreement

This agreement covers how we will work throughout the retrofit process of your home. This includes what we will do and what you need to do. It typically covers the creation of Building Performance Requirements that outlines what contractors need to take into consideration when they are quoting for your retrofit project.

Agree Contract & Start Work

Once you have your quotes and accepts them, the contractors will start ordering materials and schedule in your project. We will be doing site visits and provide technical supervision as applicable. If you are doing major works, we will also support you in when it is appropriate to pay for works in progress and deposits.

Quality Assurance & Sign Off

We will ensure that contractors do what they have promised in your contract both during site visits and remotely using evidence provided by contractors. We will support you in dealing with complaints if you are unable to resolve potential issues between you and your contractor. Once your project is complete, we will sign it off by checking the quality and let you know when final payment can be made.

Feedback & Evaluation

We will update your Whole House Plan to reflect the changes completed as well as gather and share feedback with the contractors to make the retrofit journey even better in the future.

4. Your priorities

Here is a summary of the key items you have mentioned that we have built your plan around.

- You are concerned about climate change and would like to reduce your reliance on fossil fuels.
- You are keen to insulate your home to reduce fuel bills and improve the comfort of your home.
- You a looking to invest in solar panels and battery storage and are interested in our solar offer.
- You are interested in ending your reliance on gas, by replacing your existing gas boiler with an air source heat pump.

5. Modelling assumptions

Listed are some of the assumptions we made when modelling your home.

If your home has multiple methods of construction, these are modelled individually and are shown as 'extensions'.

- Your home is a mid-terraced pre 1900 house, and you are not in a conservation area.
- Your home has solid brick walls and suspended / solid floors (uninsulated).
- The main loft is insulated to 250mm, the kitchen has a sloped ceiling (assumed uninsulated).
- You have pre-2002 double glazed windows that are in need of replacement.
- There is one main heating system, an old Worcester 28i Junior condensing combi gas boiler.
- You have an east facing front roof and west facing rear roof with a 30 degree pitch without overshading from tress or chimneys that will be suitable for PV panels.
- It is not currently possible to model the impact of a battery using the EPC regime methodology, therefore any potential energy saving costs have not been included.

6. Where you are now

Below is the estimated baseline of your home's energy performance, from which we evaluate improvements:

Data Confidence scored out of 10	Energy Rating 1 to 100 – higher is better	Fuel Bills Annual*	Tonnes CO_2 Annual*
10.0	**61 D**	**£1,850**	**3.26**
Based on the data we collected from your home	The national target for all homes by 2035 is **C**[1]	The UK average is £2500 with current price cap[2]	The UK average per home is **3.50**[3]

Your estimated current energy use, bills & emissions

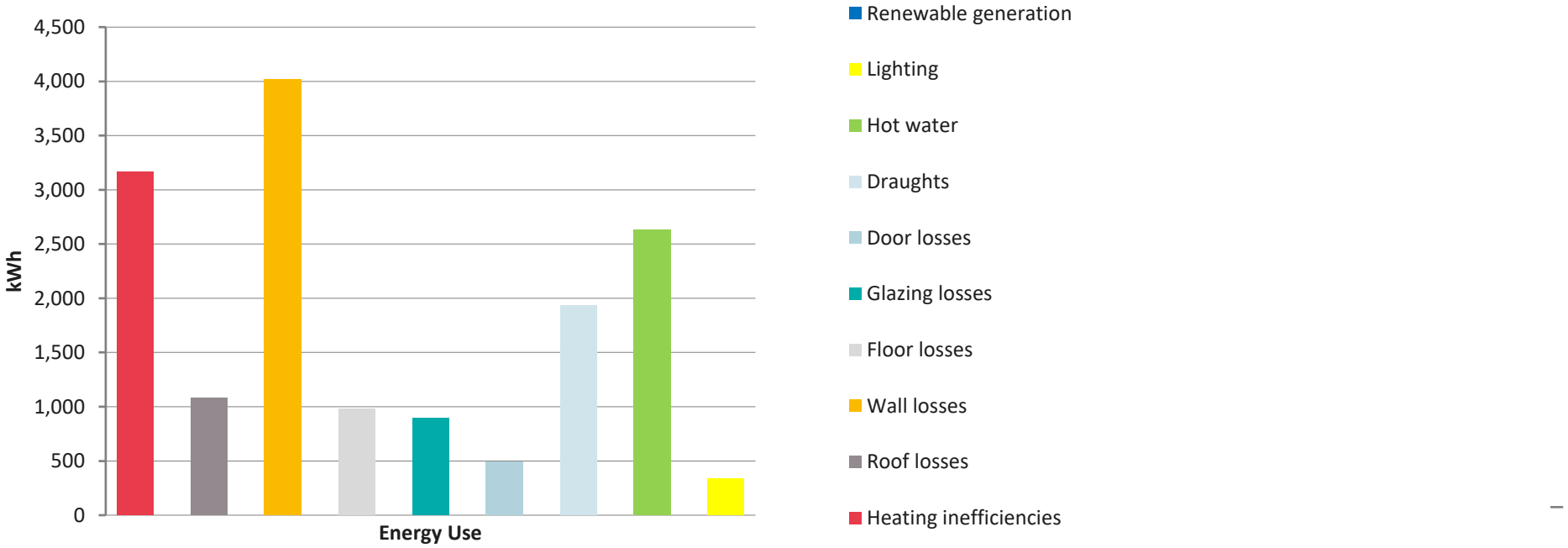
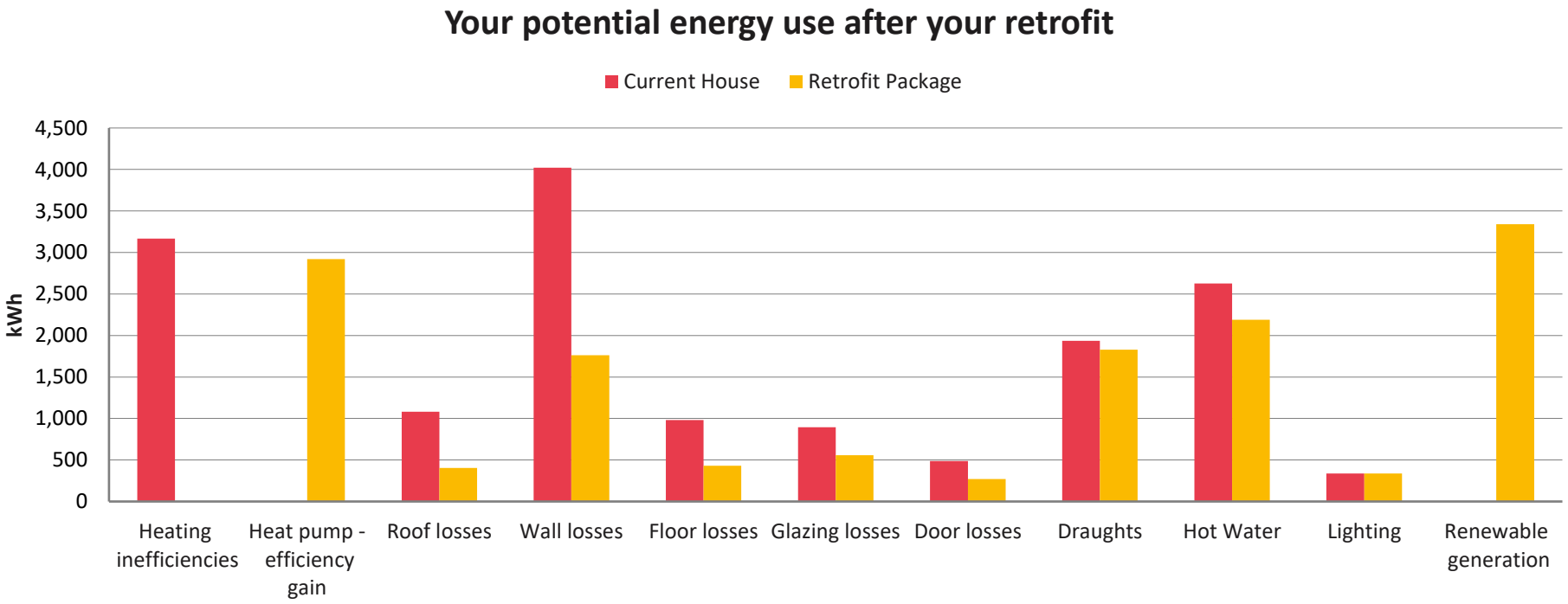


*Figure is net after revenue/adjustments from any renewables; [1]Clean Growth Strategy; [2]OFGEM; [3]Catapult (See References)

7. What you can achieve

Below are the projected energy performance improvements for your home, based on our evaluation:

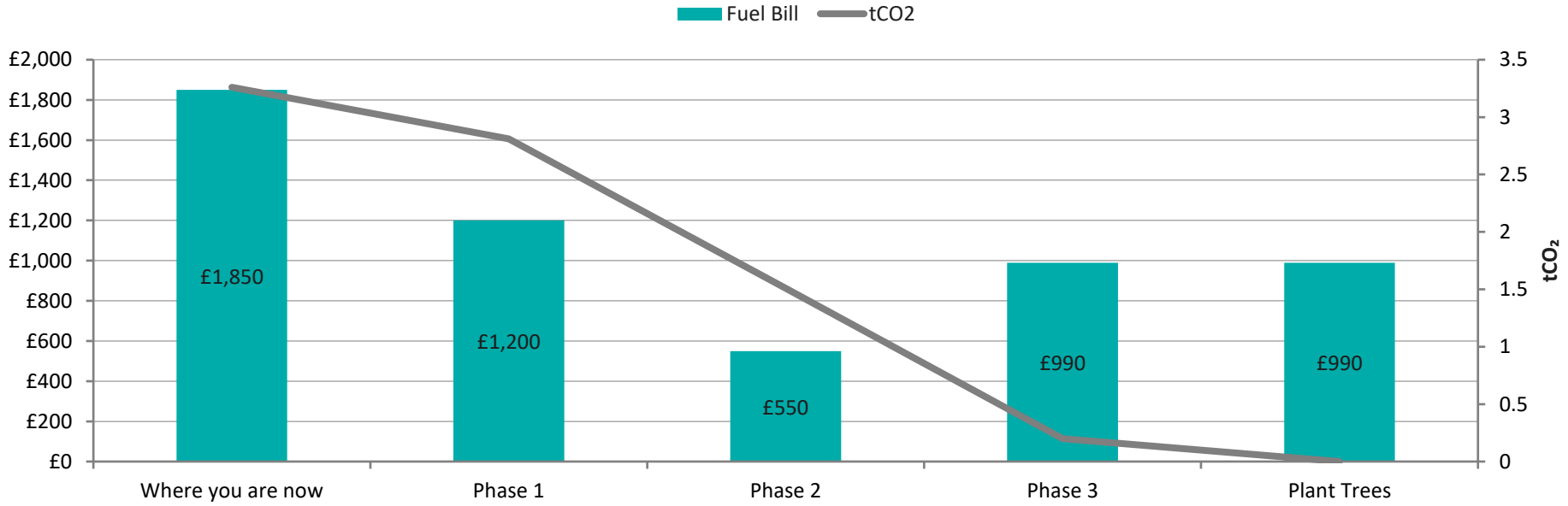
Comparison	Energy Rating	Fuel Bills	tCO_2
Before	61 D	£1,850	3.26
After	89 B	£990	0.20



8. Phasing your improvements

Summary of Packages	Estimated Costs Per Measure	Energy Rating	Fuel Bill	tCO_2
Where you are now		**61 D**	**£1,850**	**3.26**
Phase 1:	£13,430	84 B	£1,200	2.81
Phase 2:	£16,150	96 A	£550	1.51
Phase 3:	£12,000	89 B	£990	0.20
Combined savings **Combined reduction**			**£860 saving** **46%**	**3.06 saving** **94%**
Trees that you could plant to bring the remaining 0.20 tCO_2 to zero: 9				

How the phasing affects your annual bills & emissions



8. Phasing your improvements (continued)

The measures recommended below aim to significantly reduce your energy use, annual energy costs and CO2 emissions. The phases demonstrate a good range of the possibilities available. We can of course limit recommendations to your more immediate needs to fit within your current budget.

Phase 1 Measures	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
Where you are now	**Per Measure**	**61 D**	**£1,850**	**3.26**
Install PV system where potential has been identified	£7,430	84 B	£1,200	2.81
10 kWh battery storage	£6,000	84 B	£1,200	2.81
As a result of Phase 1 Measures		**84 B**	**£1,200**	**2.81**
Package Cost & % Improvements	**£13,430**		**35%**	

Your Phase 2 Measures	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
After Phase 1	**Per Measure**	**84 B**	**£1,200**	**2.81**
Internal insulation (150 mm) to pre 1900 solid walls	£7,070	90 B	£870	2.15
Roof insulation (up to 150mm) from partially insulated sloping ceiling	£420	92 A	£770	1.94
Insulated floors (150mm) from pre-1900 suspended timber floor	£1,230	94 A	£690	1.78
Insulated floors (50mm) from uninsulated exposed floor	£1,290	94 A	£660	1.71
A+ double glazed windows from individual unknown age double glazed windows	£3,800	95 A	£590	1.59
Two Part L insulated doors (all doors)	£1,560	96 A	£550	1.51
Humidity controlled kitchen extractor	£300	96 A	£550	1.51
Humidity controlled extractors per wet room	£300	96 A	£550	1.51
Trickle vents on windows	£180	96 A	£550	1.51
As a result of Phase 2 Measures		**96 A**	**£550**	**1.51**
Package Cost & % Improvements	**£16,150**		**54%**	**46%**
Cumulative Cost & % Improvements	**£29,580**		**70%**	

Your Phase 3 Measures	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
After Phase 2	**Per Measure**	**96 A**	**£550**	**1.51**
ASHP (45 degree emitters) with enhanced existing radiator central heating and hot water, from D rated gas boiler	£12,000	89 B	£990	0.20
As a result of Phase 3 Measures		**89 B**	**£990**	**0.20**
Package Cost & % Improvements	**£12,000**		**-80%**	**87%**
Cumulative Cost & % Improvements	**£41,580**		**46%**	

9. Carbon cost effectiveness

Carbon cost effectiveness is a way to express the total cost of an installation compared to its effect on reducing CO2 emission. The higher the £/tCO2, the more it costs to remove a ton of CO2. Measures with the lowest £/tCO2 are thus best if you try to reduce CO2 emissions as cheaply as possible.

It is calculated by first taking the cost of installation less the estimated fuel bill savings over the lifetime of the installation. For example, solar PV is estimated to last 25 years and its estimated fuel bill savings are thus its estimated annual fuel bill savings times 25. This number is then divided by the estimated lifetime CO2 reductions, which for solar PV would be the estimated annual CO2 reductions times 25.

Simple payback is a way to show many years it would take before a measure has paid for itself. It is calculated by dividing estimated cost of installation and dividing it by the estimated annual fuel bill savings.

Carbon cost effectiveness of phase 1 is £1,182.82/tCO_2 (lifetime) and the simple payback is 20.50 years
Carbon cost effectiveness of phase 2 is £495.38/tCO_2 (lifetime) and the simple payback is 26.81 years
Carbon cost effectiveness of phase 3 is £313.03/tCO_2 (lifetime) and the simple payback is 150.04 years
Total carbon cost effectiveness (all phases) is £505.31/tCO_2 (lifetime) and the simple payback is 31.08 years

10. Retrofit Coordinator technical review

General

Each measure in your plan needs to be specified, designed and installed in a way that ensures it suits your home. This will typically be a task for a contractor when they are providing you with a quote for what the measure will cost you to install. In some cases, it may be that architects or retrofit designers will need to be involved.

You should always be aware of what warranties and guarantees the contractor offers as part of the quote. Typically, the length of the workmanship warranty and length of guarantees on any insulation systems or appliances as well as what you might need to do to keep the guarantee, for example by having an appliance serviced annually.

Insulation and ventilation are likely to be the measures that will drive comfort the most in your home and likely to be what you feel was the best part of your retrofit even though solar PV panels might give a better financial return in the short run or an air source heat pump that will help you to drive carbon emissions down.

Phase 1

Solar PV panels and battery storage

Photovoltaic (PV) panels generate electricity from the sun which you can either use, store in a battery or send to the electricity grid. This is as opposed to solar thermal panels or tubes which generate hot water.

It is best to try and use as much of the electricity generated yourself to avoid you having to buy from the electricity grid via your supplier. Add battery storage and you can store unused energy for later use. This enables you to use more of the energy your solar panels generate, further reducing the amount of electricity you have to pay for.

Both solar panels and battery storage can be installed separately or together. At time of writing, PV alone or PV with a battery are considered energy saving measures so no VAT is charged. When batteries are installed separately, this is not the case and 20% VAT is charged. We therefore recommend installing both solar panels and battery storage at the same time. If you already have PV panels but there is space, there may be merit in considering installing more panels to avoid the VAT on the battery.

On a sunny day, you are likely to generate more electricity than you can consume. With PV alone what you don't use is exported to the grid. While this can generate income, the rate your energy supplier is willing to pay for your energy (Smart Export Guarantee) is typically quite low compared to what you pay them, so battery storage makes better use of that surplus electricity.

Battery storage doesn't only have to be charged from your roof. If have a smart meter you can change to what is sometimes called a time-of-day tariff or a variable tariff enabling you to charge your battery when energy is cheap, usually overnight, giving you cheaper electricity to use the following day. Economy 7 is perhaps the most familiar time of day tariff, Octopus Agile is currently the only variable tariff where the prices for every half hour are published the day before.

Your Home Better is working with companies to provide controllers that will use the following day's weather forecast to optimise how much to charge the battery with that cheap electricity and how much capacity to leave for the following day's free sunshine. Please note that this is not yet live but we hope to be able to offer it in the future.

Solar panels and battery storage can also work as a partial insurance policy against higher electricity prices because rises in price will only affect the smaller proportion of your energy use that you don't generate yourself. This amount will reduce further if you have a retrofit carried that reduces your energy demand.

Further benefits are on their way. The national grid (NGESO) is working on ways to pay people to use less electricity at peak times. They also have what they called Reserve Services through which the energy industry sells energy to maintain a certain balance of electricity in the grid so that when users increase energy consumption energy is there to keep the grid in balance. While some of this is done by big generators, increasingly this being done by energy storage.

One of these services is called the Balancing Mechanism and Your Home Better is working with a company that aggregates batteries for this service. This creates what is referred to as a virtual power plant as not all the batteries are in one place but are controlled as if they are. This is already a well-used model in non-domestic battery storage facilities. We are working to deliver the 1st one of these for domestic batteries. The first requirement to set up this service is to have 600 batteries on a system as there is a minimum amount of energy you have to have available to take part.

We have modelled your home with 4.8 kW solar panels equivalent to 12 panels of 400w, which roughly takes up 24 m2. We have modelled your roof as east facing to the front and west

facing to the rear, 30 degrees pitch and no to very little shading from trees or chimneys.

In the plan we have also inserted a 10 kWh battery however the EPC regime does not allow for calculating energy savings from having a battery yet. A 10 kWh battery is likely to enable you to take part in some of the future potential benefits such as the Balancing Mechanism, but a different size battery may be more suitable for you. In general, if you are less interested in maximising the benefit from a variable tariff then a smaller battery can still help you improve the benefits from your solar panels by reducing your reliance on the grid.

Phase 2

Solid Wall Insulation

Your external walls are solid brick walls typical of the construction methods and materials for that period. As you can see from the bar charts on page 6, heat losses from your walls are significant area of heat loss.

Given the attractive façade of your house it is unlikely that you would want to, or be able to, cover it up with External Wall Insulation (EWI). For this reason, we advise you to consider a mixture of External Wall Insulation (EWI) (rear) and Internal Wall Insulation (IWI) (front) for your home.

With any solid wall insulation:

- Any damp issues need to be investigated and resolved including cracked render and failing gutters. All moisture inherent in the building structure must be allowed to dry before works start.
  The current damp issues on the rear wall will need to be investigated and rectified. It may be an issue with internal condensation which can be solved with better ventilation (see below) and improved insulation levels, or water ingress from outside from leaking waste / rainwater goods.
- Uncontrolled air infiltration will be improved, and insulation work should be combined with an appropriate ventilation system (see below) to ensure that internal moisture and air quality standards are met.

One of the benefits of IWI is that it can be done on a room-by-room basis which reduces disruption and enables the coldest rooms to be tackled first. There are several issues to consider:

- IWI carries a higher risk than EWI of moisture becoming trapped between the insulation and the cold external wall. Vapour-permeable materials, such as wood fibre, lower the risk of interstitial condensation and we can specify the right insulation materials for your home; and
- the application of IWI needs to be carefully specified, especially at corners and around windows, to avoid gaps in the insulation which can lead to thermal bridging and

increased heat loss. We will do this through our building performance specification.

The latest research stresses the need not to over-optimise insulation levels in traditionally built houses and it is possible to achieve meaningful reductions in heat loss with 40-60mm of IWI.

There are high performance 'vapour open' materials that offer good insulation levels at a minimal thickness. These insulation materials are expensive but can be used in areas where there is concern regarding loss of space, awkward areas such as window reveals.

External Wall Insulation (EWI) as the preferred method of insulating walls of a home when the appearance of the façade is of a less critical factor.

EWI is generally preferred to IWI as it is less disruptive; does not reduce room size; and carries less risk of interstitial condensation which can lead to damp and mould growth. Other issues to consider with EWI are:

- minimising heat loss around the windows – either by installing new windows in the insulation layer or retaining the existing windows and carefully insulating the reveals.
- in some cases, planning consent may be required, although unlikely at the rear of the property.

Any external walls insulated should be insulated using a system approved by the British Board of Agreement (BBA).

In general, care needs to be taken at all junctions of insulation to ensure a robust retrofit and avoid thermal bridges which become critical in a well-insulated home; this could mean that there is some Internal Wall Insulation applied to the party walls of the home.

Sympathetic insulation materials

This refers to the ability of the structure of the home to maintain an equilibrium between the moisture in the internal air, the walls, and any rain that may fall on the wall.

These original walls were made with materials that cope with moisture changes very well. If they are lined with insulation, we need to design systems that maintain that ability. If not designed well, the wall can get very wet either from rain ingress or from an accumulation of internal moisture. This will wick heat away from the building more quickly.

It is most significant with Internal Wall Insulation, as moisture can accumulate behind it on the cold wall causing 'interstitial condensation'.

We must evaluate these risks and design accordingly. This can be done by using materials that are 'vapour open' i.e. they handle ingress and egress of moisture. Woodfibre is an excellent example, with the added benefits of low embodied energy, no off-

gassing or VOCs, and having a higher thermal mass that helps to retain a constant internal temperature.

Pitched Roof Insulation

Insulation levels of the pitched roof above the single storey kitchen could not be inspected. During the next scheduled maintenance or decoration, this roof should be insulated.

We would expect there to be at least 150mm insulation at the rafters OR 300mm insulation at the joist level where possible, again ventilation behind the tiles or of the roof space should be considered.

Suspended Timber Floor insulation.

The floors of your home are mostly built using suspended timber typical for that period, either over a void or above the unheated cellar. Although there isn't a huge quantity of heat lost through the floors, insulation of suspended timber floors can have a positive impact on thermal comfort levels due to eliminating the airflow that comes up through the floorboards and greatly improving the airtightness of the home.

Installing insulation between the joists must be carried out with great care to ensure that adequate ventilation is maintained, and that moisture is prevented from building up in the floor joists and causing rot.

The rear suspended floors of your property already have signs of damage possibly due to rot. This will need to be investigated and repaired if necessary.

The cellar also shows signs of damp and condensation. Along with insulating the void between the cellar and upstairs, adequate ventilation needs to be supplied to the cellar to prevent moisture build-up, damp and timber rot.

The method and type of insulation depends on accessibility; the depth of the joists; and moisture conditions beneath the floor. In general, vapour permeable materials such as hemp fibre, cellulose or wood fibre are best used because their moisture buffering qualities help reduce the risk of condensation.

Solid Floor insulation

The floor in the single storey kitchen area is solid concrete, presumed uninsulated. Generally, we don't recommend insulating solid ground floor unless it must come up for other reasons or it's part of a deep retrofit with high performance targets.

Solid floor insulation tends to have a lower impact on fuel bills and carbon emissions than wall insulation because heat loss to the ground is less than to the air.

Solid floors either need to be dug up to add insulation to the sub floor and relayed, or if it's possible, to lay insulation on top of your existing floor, (this is a low cost, low disruption initiative that we would recommend).

If the existing floor is to be broken up to accommodate the insulation, then you should consider carefully whether the expense and disruption are justified by the improved comfort levels and resultant fuel/CO2 savings.

Underfloor heating.

Any of the above options for floor insulation can be adjusted for laying an underfloor heating system that would replace the existing ground floor heating distribution system. This new underfloor heating system should be spec'd so it can be used for the Air Source Heat Pump (ASHP).

It is also possible to install underfloor heating upstairs on trays between the floor joists. If the whole heating system is upgraded to underfloor heating, then the ASHP will be able to run at a lower, more efficient, flow rate of 35ºC.

Windows and doors

Windows and doors have been some of the most popular retrofit measures for many years because they have a major impact on the appearance of your home. This means that most homes already have good double glazing and quality doors meaning that installing new ones might not be the most cost-effective measure. Windows also come with triple glazing with an even better energy efficiency but are typically most suitable for homes that aim for a very high airtightness and insulation level as well as installing a larger ventilation system.

Your home already has double glazing, but it has been installed many years ago and is starting to be draughty. This applies to your door as well. We therefore recommend installing new double-glazed windows. The cheapest windows are typically made with frames from uPVC but timber framed windows can sometimes last longer and can also be a more sustainable choice. We have also included new insulated doors which is not essential but if your existing door feels draughty or you are thinking of changing it for security reasons then it would be sensible to consider an insulated and draught-proofed one.

Airtightness and ventilation

We generate a lot of moisture in the home through cooking, washing and breathing. This moisture often escapes through gaps and cracks around the home (draughts). Reducing draughts is essential to reducing heat loss but it is also necessary to ensure there's sufficient circulation of fresh air to maintain good indoor air quality. Poor ventilation can cause damp in winter and overheating in summer. It can have serious health implications including fatigue, headaches, chest infections and exacerbation of allergies and asthma.

Based on the build date of your house, the airtightness is likely to be poor and draughts could be contributing to your fuel bills. Insulation measures, if done well, will improve airtightness but other actions such as sealing gaps around service penetrations; and placing thermal hoods over the back of LED downlights can make a difference.

Reducing uncontrolled air infiltration is important for reducing heat loss but it must be replaced with a controlled ventilation strategy otherwise indoor air pollutants will build up that can cause health problems. As a minimum we have included decentralised humidity-controlled ventilation and extraction in all wet rooms and then the installation / specification of trickle vent to all windows.

Phase 3

Heating and hot water

Switching to electrical forms of heating such as storage heaters or heat pumps can be an impactful way of reducing carbon emissions particularly as the national grid decarbonises at an increasing rate.

Heat pumps work most efficiently in well insulated houses where a flow temperature of between 35° to 45° is sufficient to keep the house warm. It is important to carry out insulation and draught-proofing changes prior to installation to ensure the heat pump is correctly sized for the heat demand of the house.

A technical survey must be carried out prior to the installation, to inform the design, and to make sure that all the correct equipment is ordered in advance to make the installation as seamless as possible.

The technical survey looks at the logistics of where the new equipment can go, and if the space used for existing equipment can be used in the same way. There is also a heat-loss calculation for each room, assessing the existing radiators to determine if they are correctly sized for the lower-temperature heat from the ASHP. It is usual for some radiators to require replacement to make a heat pump work efficiently.

The installation of heat pumps usually falls within permitted development rights providing certain criteria are met. ASHPs are best located as close to the home as possible to reduce heat loses in pipework running to and from the house, however they can be sited away from the house with the knowledge that there would be a slight reduction in performance. Noise will be considered when siting of the heat pump unit and this is considered as part of the technical survey.

Your current gas heating system is quite old and in need of replacement soon, an air source heat pump (ASHP) is likely to be the most viable non-fossil fuel heating option for you. ASHPs are 250-300% efficient which means that for every unit of electricity used to power them they produce 2.5-3 units of heat. They are an effective way of reducing carbon emissions because the national grid is decarbonising at an increasing rate. Depending on the type and efficiency of the boiler they replace, ASHP can be cost neutral (but can also be more expensive) in terms of running costs vis-à-vis mains gas, because electricity prices are much higher than gas. Therefore, we recommend making insulation improvements, to reduce the heat demand of the house, before installing a heat pump.

If you decide to run the ASHP on the existing radiator system, or a mix of underfloor and radiators then an ASHP with a flow temperature of 45ºC will be required, if the whole house is converted to underfloor heating then a lower / more efficient flow temperature of 35ºC will be sufficient.

Incorporating an ASHP with a PV system will also help to reduce costs as the electricity from the PV panels will contribute tot the electricity demand of the ASHP.

Existing Heating System

In the meantime, there are a few changes that can be made to the existing heating system to improve the control and performance.

The efficiency rating of your boiler is stated as 89% efficient at turning gas into heat; a lot of condensing-combi boilers are set-up with very high flow temperatures of around 70°C. Usually this flow temperature is much higher than needed to heat the home and reduces the efficiency of your gas boiler down to as low as 75% efficient.

Flow temperatures on boilers are easily changed and returned to their previous state if you find the home too cold after the change. This could come part of your annual routine as you manage the heating of the home.

11. Paying for your retrofit

Your Home Better is set up to accelerate retrofits for homeowners willing to pay and not only those who are able to pay. To us, this means that we are striving towards making retrofits available to homeowners who needs access to loans in order to pay for their retrofit. We do not have grants to allocate but we want to make homeowners aware of various options that might be available to them.

Homeowners who are installing a heat pump will be able to receive a grant worth £5000 for an air source heat pump and £6000 for a ground source heat pump through the government's Boiler Upgrade Scheme. The application process is done by the installer once you have accepted their quote. More details can be found here: https://www.ofgem.gov.uk/environmental-and-social-schemes/boiler-upgrade-scheme-bus

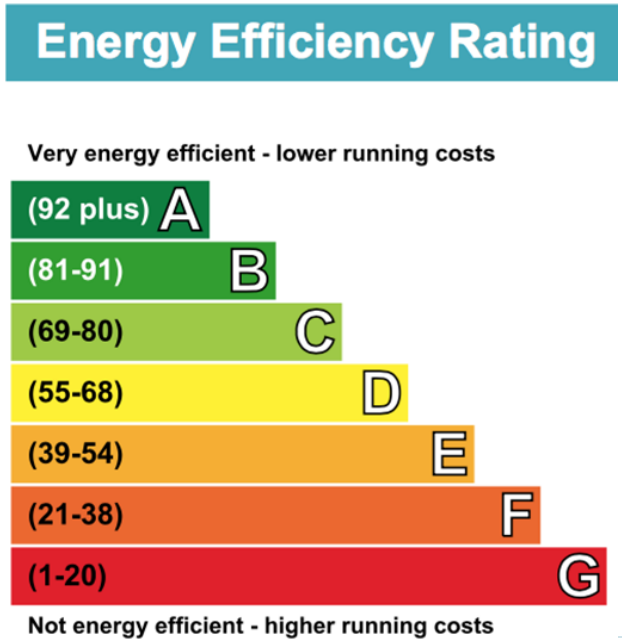
Your Home Better is working together with Manchester Credit Union to provide homeowners with an attractive loan option. The offer is run completely by Manchester Credit Union, and you will thus need to go through their standard assessment process and comply with their terms and conditions for taking out a loan.

The loans are for a period of 10 years at 5.5% APR and can be used to finance carbon reduction measures such as solar PV panels and battery storage. Interest is charged on the reducing balance of the loan, therefore the quicker the loan is repaid, the less interest you need to pay. There are no penalties for paying the loan off more quickly at a higher amount or for settling the loan before the end of the term.

The offer is geographically limited to the remit of Manchester Credit Union, which means that you have to either live or work in Manchester, Trafford, Stockport, Rochdale, Bury or Tameside in order to take part. We are also working towards identifying similar offers from other financial institutions and credit unions to ensure that all of Greater Manchester can access loans to fund their retrofit. We are keen to find local finance offers that can keep money in the local economy and like us, Manchester Credit Union is a not-for-profit organisation working for the benefits of its members.

At the moment, Manchester Credit Union has finance available for around 350 solar PV panels and battery storage installations.

12. Glossary, Useful Links & References

Glossary			
ASHP	Air Source Heat Pump	IWI	Internal Wall Insulation
GSHP	Ground Source Heat Pump	EWI	External Wall Insulation
CWI	Cavity Wall Insulation	tCO_2	Tonnes of Carbon Dioxide
PV	Solar photovoltaic panels	kWh	Kilowatt hours
TRV	Thermostatic Radiator Valve	BUS	Boiler Upgrade Scheme
EPC/Energy Rating	Energy Performance Certificate: A SAP Rating is a way of comparing energy performance of different homes – it results in a figure between 1 and 100+ (100 representing zero energy cost and anything over means you are exporting energy). The higher the SAP rating, the lower the fuel costs and the lower the associated emissions of carbon dioxide. Note that an Energy Efficiency Rating is proportional to fuel bill divided by floor area.		

Useful Links	
Retrofit Coordinator	https://www.youtube.com/watch?v=k4nJlJXpo9A&feature=emb_logo
UKCMB - Ventilation	https://www.youtube.com/watch?v=aBWlXLMnqBk
STBA - Solid Wall Insulation	https://www.youtube.com/watch?v=6KFC0vbxii8
OFGEM - BUS	https://www.ofgem.gov.uk/environmental-and-social-schemes/boiler-upgrade-scheme-bus
CCC - Homes for the Future	https://www.theccc.org.uk/wp-content/uploads/2019/02/Homes-of-the-future-are-needed-today-Infographic-A4.pdf

References	
Clean Growth Strategy	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf (page 13, point 12)
OFGEM - Price Cap Explained	https://www.ofgem.gov.uk/information-consumers/energy-advice-households/check-if-energy-price-cap-affects-you
Catapult - Living Carbon Free	https://es.catapult.org.uk/wp-content/uploads/2019/06/ESC-Living-Carbon-Free-report-for-CCC.pdf
BEIS - 2018 UK GHG emissions	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/863325/2018-final-emissions-statistics-summary.pdf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