cosy homes
oxfordshire

Blackbird Leys, Oxford

Whole House Plan
Sample

happy . healthy . homely

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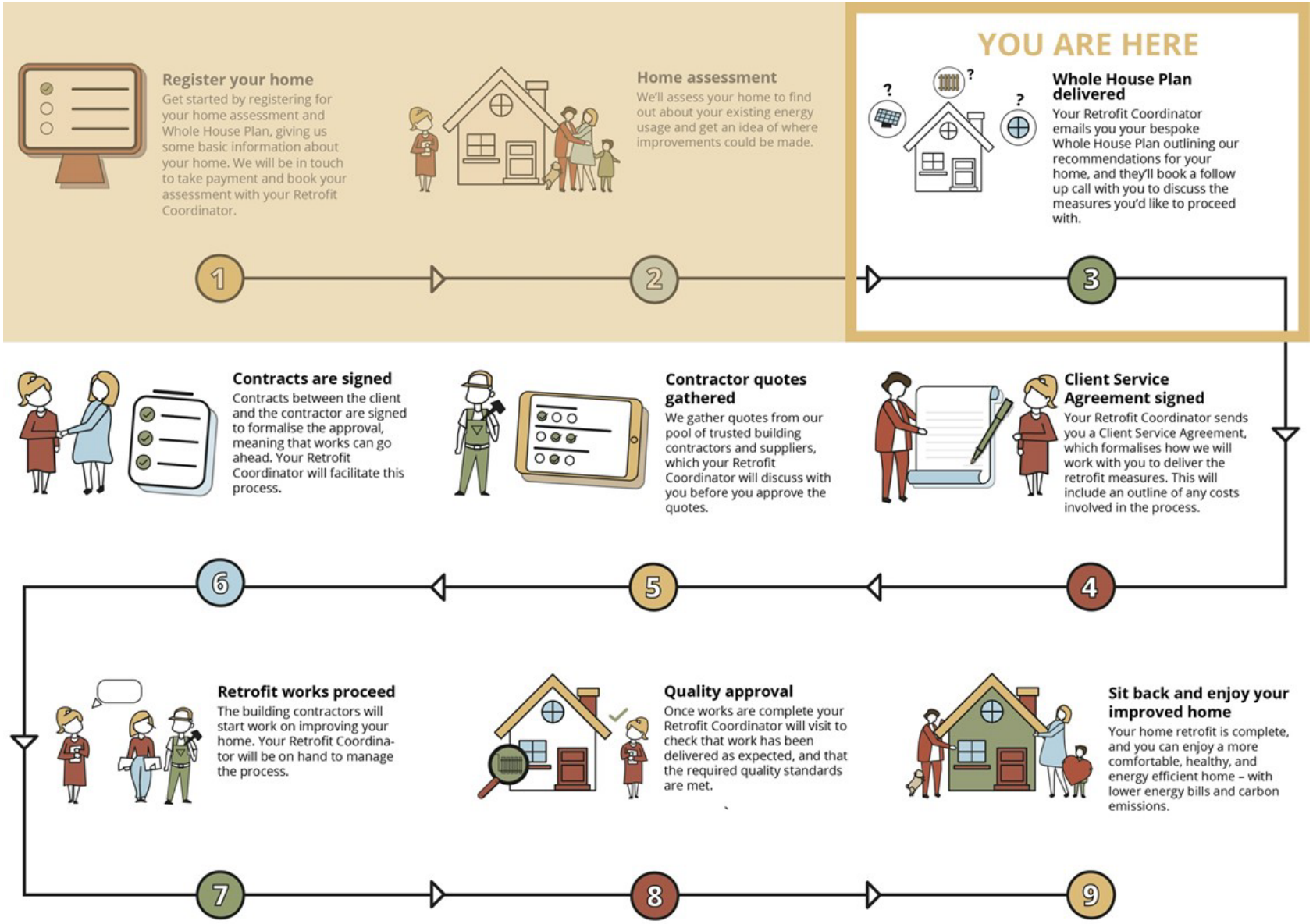
1: Your Retrofit Journey



2: Introduction

This Whole House Plan has been produced following a home assessment carried out to collect information about your home, and how you think you would like to improve it. We have set out your options, packaged up to suit your preferred upgrade process, and clearly shown the estimated costs and benefits of each stage.

The Plan should be regarded as a 'live' document and can be adapted to suit changes in packages, or the implementation of other ideas should they arise. This may happen as discussions progress, and we are happy to continue to develop it further after signing the Client Service Agreement.

3: Methodology

We have evaluated your home by looking at your estimated

- fuel bills in £,
- environmental impact in Carbon Dioxide (CO_2) emissions, and
- energy use in kilowatt hours (kWh)

We use the nationally accepted methodology for calculations that underpins the Energy Performance Certificate (EPC) regime for all UK homes, but we don't rely on the automated EPC recommendations.

Using our expertise, the data we collect from your home is used to generate a range of appropriate and individual home improvements. You can then move forward easily with your preferred upgrades.

How we help you invest in your home

Strategy
First, we identify all possible measures that will impact on your energy bills, comfort, and environmental impact. This **Whole House Plan** is your strategy.

Specification
Each measure is designed to suit your home in a way that a contractor will be able to understand and install.

Groups of measures are selected and designed to complement each other as well as your home.

Futureproofing
We ensure that all future measures are not blocked by the initial work, thereby reducing work and costs in the long-term.

4: Your priorities

Here is a summary of the key items that you communicated to us.

- You would like to improve the energy rating of the house as well as reduce the fuel bills for your tenants.
- You would like to resolve some of the damp/condensation issues in the bedrooms and improve internal comfort levels.
- You would like to increase the value of the house and protect it from deterioration.

5: Modelling assumptions

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

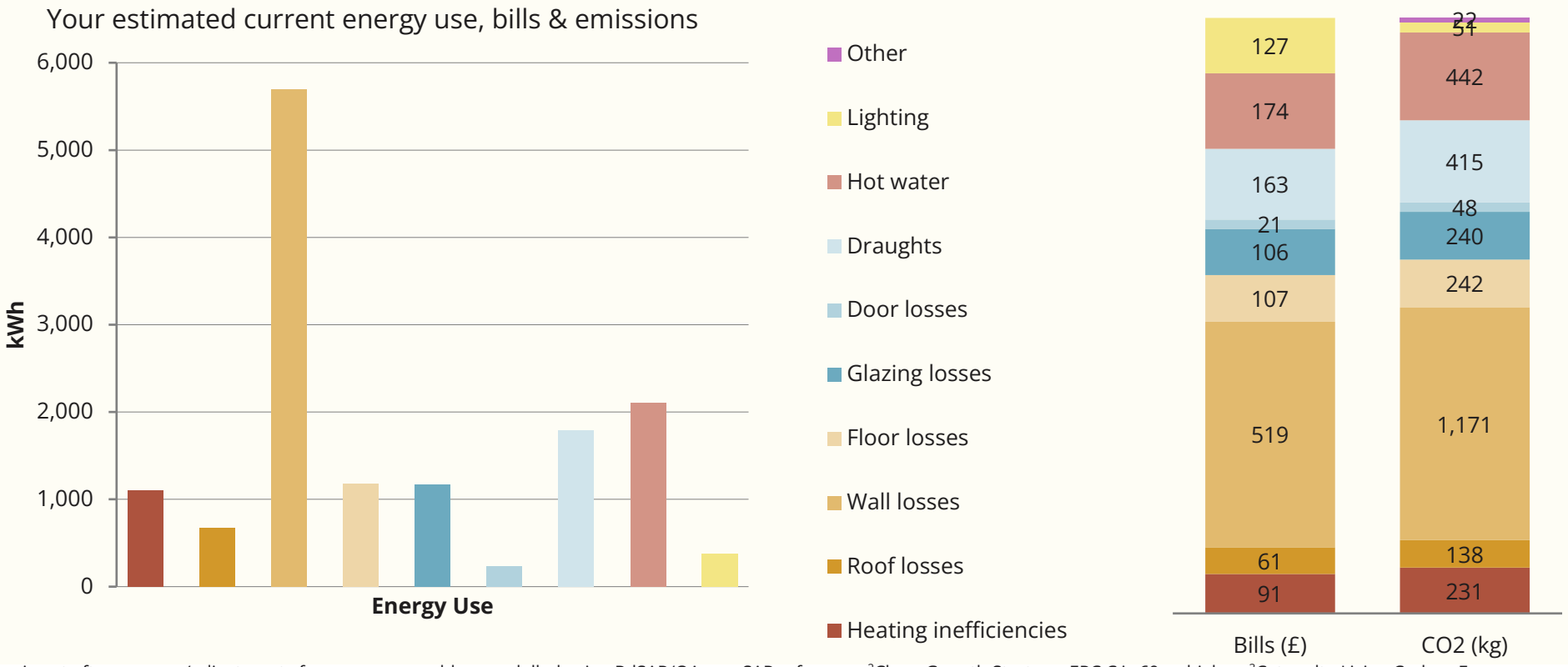
If your home has multiple methods of construction, these are modelled individually and are shown as 'extensions'.

- Your house is in Blackbird Leys and it is not within a conservation area.
- It is end of terrace and was built in the 1950s. The house has been modelled in the following way:
    - Main: 1950s; 2 storeys; ground floor walls are cavity (300mm); first floor walls are solid (180mm) with hung wall tiles; solid floors; loft with insulation (150mm) at joist level.
    - Extension 1: 1950s; single storey (store/boiler room); cavity walls (300mm); solid floor; flat roof (as built).
- 100% of the windows are uPVC double glazed (post-2002).
- There is one main heating system, an A rated condensing combi gas boiler which is 89% efficient. The house is heated by radiators and the chimney has been blocked.
- The occupancy is 2 adults and 3 children.

6: Where you are now

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

Net Energy Use estimated annual kWh[1]	Energy Rating 1 to 100 – higher is better	Fuel Bills Annual[1]	Tonnes CO_2 Annual[1]
14,478	**68 D**	**£1,330**	**3.0**
A kilowatt hour (kWh) is a unit of energy use used by energy suppliers	The national target for all homes by 2035 is EPC **C**[2]	Calculated using our energy survey and the current price cap tariff: may differ from your actual bills	The UK average per home is **3.50**[3]

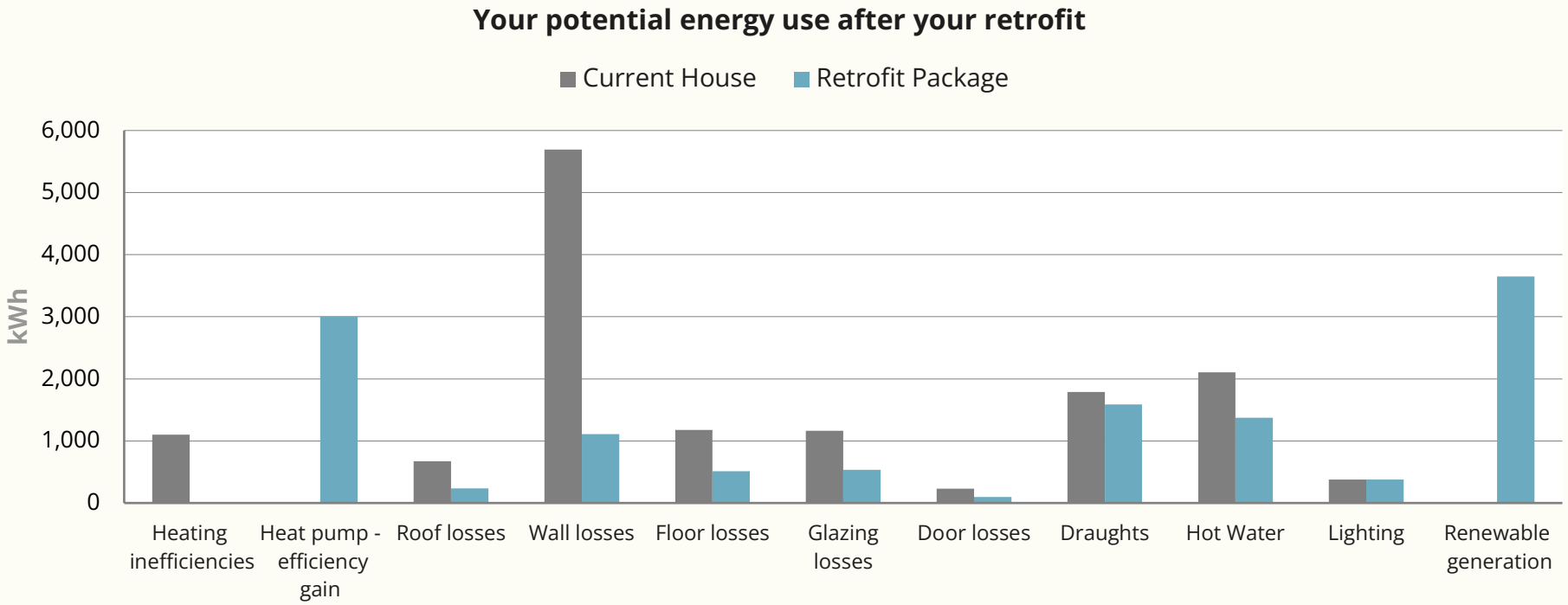


[1]Figure is net after revenue/adjustments from any renewables, modelled using RdSAP/OA, see SAP reference; [2]Clean Growth Strategy, EPC C is 69 or higher; [3]Catapult - Living Carbon Free
Where present, 'Other' includes values for pumps, fans and (occasionally) non-standard energy saving/generation technologies.

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	68 D	£1,330	3.00
After	102 A	£210	-0.11



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8: How we help you

Our homes are responsible for 15% of UK emissions[1], so there is no better place to start taking steps to reduce your carbon footprint and help address the Climate Emergency.

The Government's Clean Growth Strategy[2] sets a target to upgrade as many homes as possible to EPC Band C by 2035.

We have gone further by showing a range of measures that will get your home closer to zero energy bills and zero CO_2 emissions.

We have packaged these measures into phases to facilitate such a level of reduction, even if that work is carried out after you have moved to a different home.

[1]BEIS (See References) [2]Clean Growth Strategy

9: Caveats to this analysis

The costs in this plan are indicative. They are the current best estimate we have for your measures and are subject to change. The costs only include the works pertaining to the energy efficiency measures e.g. loft insulation is for the materials and labour of adding extra insulation over the existing insulation. It does not include any costs for eaves trays, boarding, widening the loft hatch etc.

They are not quotations. Savings are based on energy bill rates prevalent on the market at this time. Should you wish to take any of the measures forward, we will gather quotes from our pool of trusted contractors.

Estimated budget costs do not include:

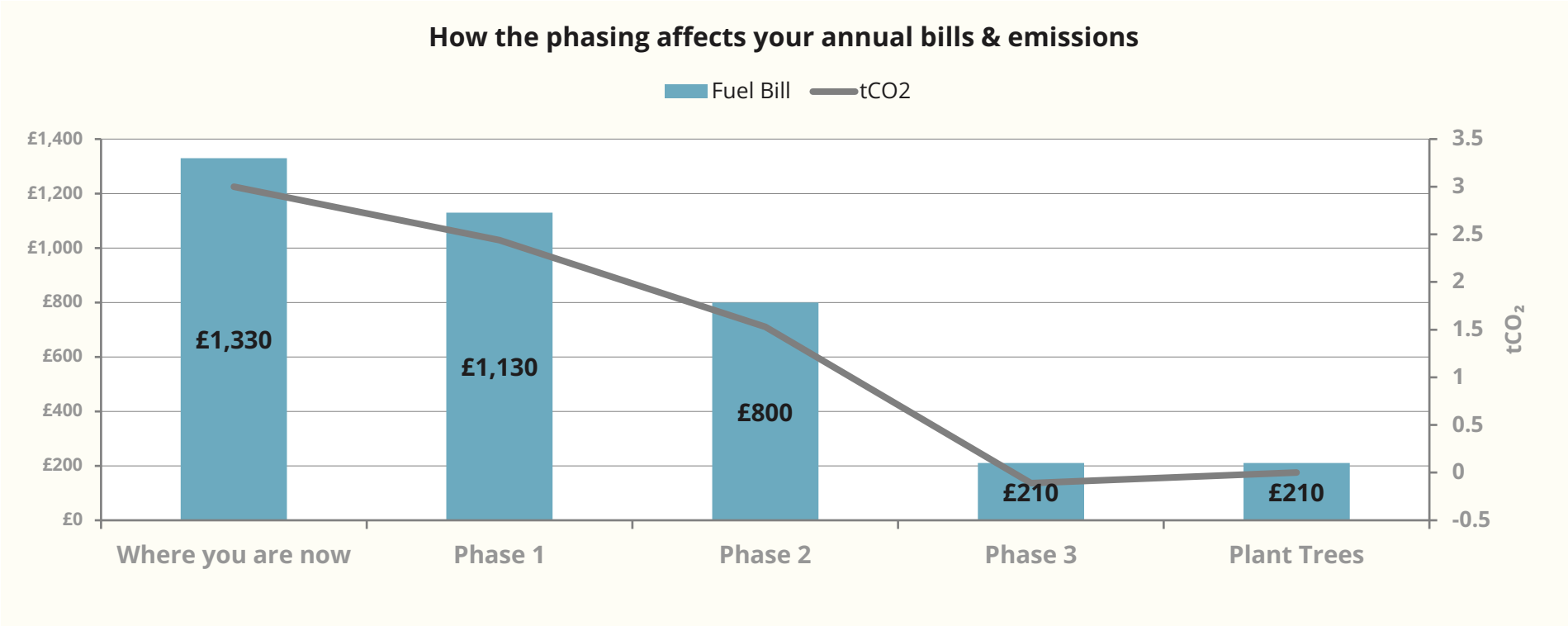
Preliminaries & Professional fees
Preliminaries such as scaffolding cannot be estimated at this stage, they can only be quoted for after a contractor has assessed your requirements. Furthermore, some additional professional fees may apply to your project, such as architectural services or additional surveys, and these costs are not included in your estimates.

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.

Redecoration costs
Due to the significant differences in personal requirements for each home, we are unable to estimate the costs of redecoration.

10: Phasing your improvements

Summary of Packages		Estimated Cost Per Phase	Energy Rating	Fuel Bill	tCO_2
Where you are now			**68 D**	**£1,330**	**3.00**
Phase 1:	Minor Retrofit Measures	£10,540	72 C	£1,130	2.44
Phase 2:	Major Retrofit Measures	£40,950	80 C	£800	1.53
Phase 3:	Renewables	£25,500	102 A	£210	-0.11
Combined savings				**£1,120 saving**	**3.11 saving**
Combined reduction				**84%**	**104%**
Trees that you could plant to bring the remaining	**-0.11**	**tCO_2 to zero**		**-5**	


How the phasing affects your annual bills & emissions
Fuel Bill
tCO2
£1,400
£1,200
£1,000
£800
£600
£400
£200
£0
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
tCO2
£1,330
£1,130
£800
£210
£210
Where you are now
Phase 1
Phase 2
Phase 3
Plant Trees

The measures recommended below aim to significantly reduce your energy use, annual energy costs and CO_2 emissions. They demonstrate a good range of the possibilities available, although some of them may be beyond your current budget.

Minor Retrofit Measures	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
Where you are now	**Per Measure**	**68 D**	**£1,330**	**3.00**
Increase loft insulation from 150mm to 300mm	£2,070	69 C	£1,310	2.94
Cavity wall insulation to 1950s cavity walls	£1,340	72 C	£1,160	2.51
Check construction of party wall and fill cavity if appropriate	£1,050	72 C	£1,150	2.50
Insulate flat roof (up to 150mm) of single storey extension	£2,280	72 C	£1,140	2.47
New insulated front door	£2,500	72 C	£1,130	2.44
Humidity controlled extractors in kitchen and bathroom and passive ventilation in other rooms	£1,300	72 C	£1,130	2.44
After Minor Measures		**72 C**	**£1,130**	**2.44**
Package Cost & % Improvements	**£10,540**		**15%**	**19%**

Major Retrofit Measures	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
After Minor Measures	**Per Measure**	**72 C**	**£1,130**	**2.44**
External wall insulation to 1950s filled cavity walls	£13,370	74 C	£1,040	2.18
External insulation to non-cavity first floor walls	£8,040	77 C	£900	1.81
Insulated floors (50mm) from 1950s solid floor	£7,120	79 C	£850	1.66
Triple glazed upvc windows from post-2002 double glazing	£12,420	80 C	£800	1.53
After Major Measures		**80 C**	**£800**	**1.53**
Package Cost & % Improvements	**£40,950**		**29%**	**37%**
Cumulative Cost & % Improvements	**£51,490**		**40%**	**49%**

Renewables	Estimated Costs	Energy Rating	Fuel Bill	tCO_2
After Major Measures	**Per Measure**	**80 C**	**£800**	**1.53**
Air Source Heat Pump with enhanced existing radiators and new hot water tank	£18,000	82 B	£880	0.38
Install 4kW PV system where potential has been identified	£7,400	102 A	£210	-0.11
EPC	£100	102 A	£210	-0.11
After Renewables		**102 A**	**£210**	**-0.11**
Package Cost & % Improvements	**£25,500**		**74%**	**107%**
Cumulative Cost & % Improvements	**£76,990**		**84%**	**104%**

11: Retrofit Coordinator technical review

Each measure needs to be specified in a way that ensures it suits your home and lifestyle. The measures in this report must be detailed correctly so that the contractor is able to fully understand the implications of not designing and installing the work correctly.

General

The measures above have been included because they are feasible for your house and demonstrate how you might lower your fuel bills and carbon emissions closer to zero over the longer term. Some of the measures may be too disruptive or expensive and it's expected that you will focus on the measures that are most likely to meet your shorter-term objectives.

Our software produces measures based on data collected during the survey and on build dates. If you want to understand more specifically how different elements of your house perform the following surveys are available on request:

- Thermal image surveys highlight heat loss pathways.
- Borescope surveys identify construction/insulation materials in inaccessible places.
- Airtightness tests measure ventilation rates.

Roof Insulation

Your house has two different roof types. The main part of the house has a pitched roof (concrete tiles) with a loft below. The loft has 150mm of mineral wool at joist level. Best practice is to have 300mm of insulation, laid between and over the floor joists. Increasing your loft insulation has been included in the minor retrofit phase. If your tenants store things in the loft then you should consider a proprietary loft boarding system so that the insulation is not compressed. We also recommend that your loft hatch is insulated and draught proofed.

You mentioned that some of the bedrooms have black mould forming at the junction between the wall and ceiling. Mould forms where humidity levels are high (typically in bedrooms where moisture builds up overnight as people sleep) and surface temperatures are low. If your loft insulation stops short of the eaves then cold spots can form at the wall-ceiling junction in the rooms below. When increasing your loft insulation it's crucial to make sure that the loft is properly ventilated so that moisture doesn't build up and rot the roof timbers. Additional ventilation can be provided by roof lap vents inserted through the roofing felt from the loft.

The small, single storey extension at the front of the house has a flat roof and increasing its insulation levels has been included as a minor measure because our software indicates that it is insufficiently insulated. It would be advisable to assess the lifespan of the roof covering and combine improved roof

insulation with new roofing materials. We would recommend a warm roof, where the insulation sits on top of the roof deck, as this avoids issues with moisture in the roof void due to the difficulty of ventilating it.

Wall Insulation

All the walls are cavity (including the party walls) apart from the first floor front and rear walls which are solid concrete blocks (180mm) covered in hung walls tiles. It's not clear whether your cavity walls have been filled with insulation and I've included cavity wall insulation (CWI) as a minor retrofit measure in your plan. The first step would be to have a borescope survey done which drills a few small holes into your walls and inserts a camera on a probe to inspect the cavity.

CWI is a low cost, low disruption measure but the thickness of the insulation and the reduction in heat loss is limited by the depth of the cavity. You can see from the graph on p5 that your walls are the biggest contributor to your heat losses and to improve performance further and insulate the first floor front and rear solid walls you would need to apply external wall insulation (EWI).

EWI for all the walls has been included as a major retrofit measure. Mostly commonly, EWI has a rendered finish so it would change the external look of your property but it is possible to apply timber cladding or brick slips to break up the uniformity of the render. Your roof has a decent overhang so it's unlikely that you would need to extend it to cover the additional thickness of the insulation.

Floor Insulation

You have solid floors throughout the house. Solid floor insulation tends to have a lower impact on fuel bills and carbon emissions than wall insulation because heat losses to the ground are less than to the air. Insulation of your solid floor has been included as a major retrofit measure to demonstrate how to get your home closest to zero carbon and because it can improve thermal comfort levels. If the existing floor needs to be broken up, then solid floor insulation is disruptive and costly but occasionally it's possible to apply thin floor insulation on top of the existing floor slab.

If you insulate your solid floor, it is sensible to consider underfloor heating at the same time because it frees up wall space from radiators and works particularly well with heat pumps

Windows and doors

All your windows are uPVC double glazed with a 16mm glazing and, from discussions with you, were installed about 6 years ago. It is not necessary to replace them but if you apply external wall insulation in the future you may want to consider installing triple glazing at the same time. EWI and window replacement are ideally complemented because the junction between the window frame and the wall can be insulated and made airtight. The way windows are installed is crucial to their performance.

There is evidence of some mould growth around the edges of the bedroom windows and this indicates that they may have been poorly installed, creating draughts and cold spots around the

frames. You could consider insulating the window reveals with a thin, high performance insulation material and applying airtightness tape between the frame and the wall.

A new insulated front door has been included as a minor measure. It is not essential because the software does not show it as having a major impact on fuel bills or carbon emissions but if your door is draughty and contributing to the coldness of the entrance then you may want to consider measures to improve it.

Airtightness and Ventilation

Based on the build date of your house and the various extensions, 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.

The house has a fairly good existing ventilation system with trickle vents on all the windows; sufficient undercuts on the internal doors; and intermittent extractor fans in the WC and bathroom. The kitchen cookerhood is a circulating extractor but it should be vented to the outside to extract moisture generated from cooking. To help reduce any mould growth in the bedrooms, you could encourage your tenants to keep the trickle vents open on the windows.

Reducing uncontrolled air infiltration is important for reducing heat loss but it must be replaced with a controlled ventilation strategy (a requirement of the latest Building Regulations) otherwise indoor air pollutants will build up and cause health problems. As a minimum we have included decentralised humidity-controlled ventilation and extraction in the minor retrofit phase above but if you move forward to the next stage then we will do a full review of your home's ventilation considering the other improvements being made.

Heating and hot water

Your current boiler is a condensing combi gas boiler (89% efficient) which has been installed recently.

It is not necessary for you to replace your gas boiler with a heat pump yet but in the future 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 (and occasionally more expensive) in terms of running costs vis-à-vis mains gas, because electricity prices are 3 or 4 times more expensive than gas. ASHP would not be suitable for your tenants until insulation improvements are made to the house to reduce its heat demand. Another consideration for you is that with a heat pump you would need to find internal space for a hot water tank.

There is a government grant available, called the Boiler Upgrade Scheme, to help people with the cost of heat pump installations: https://www.ofgem.gov.uk/environmental-and-social-schemes/boiler-upgrade-scheme-bus

Renewables

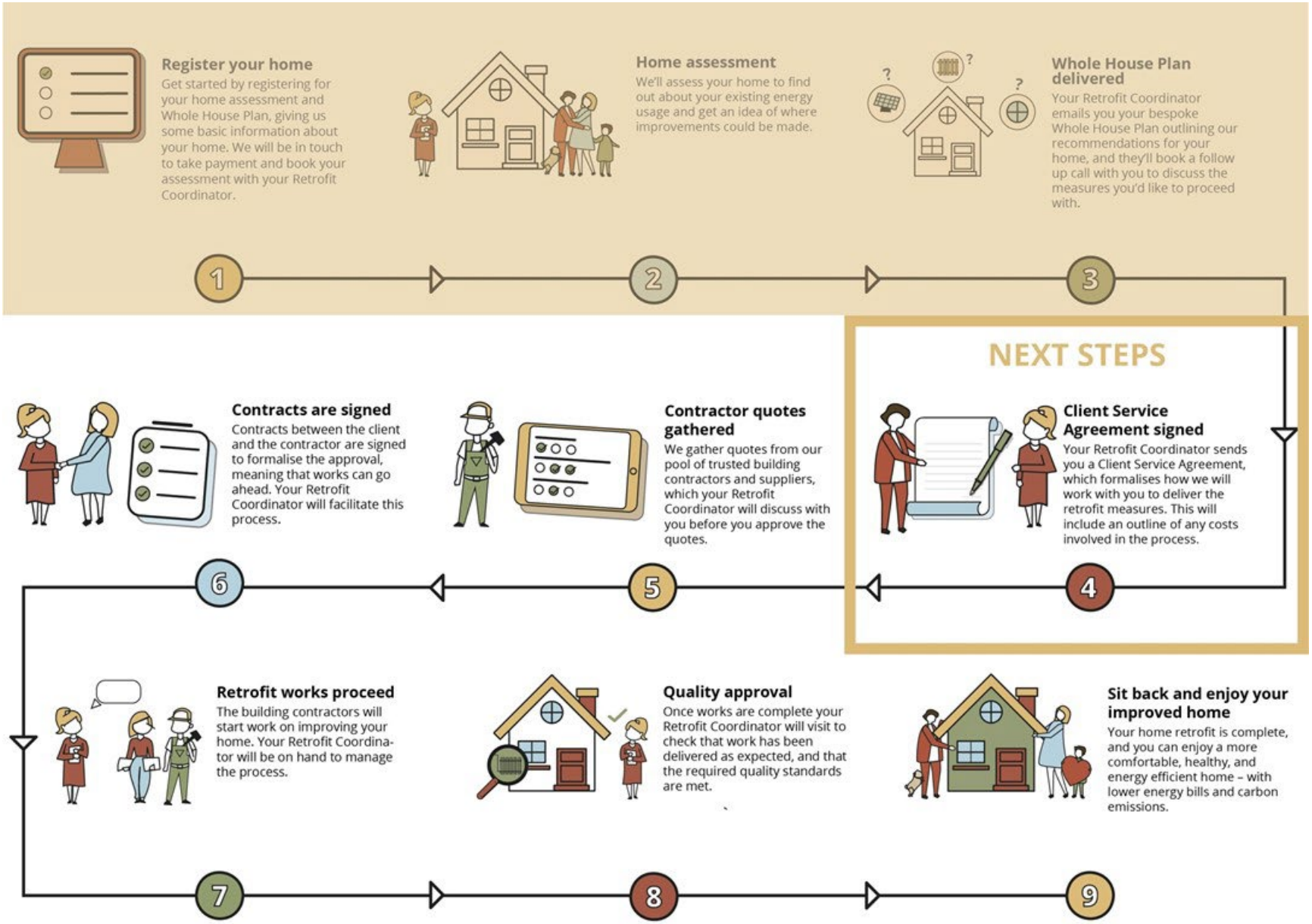
I've included Solar PV in the Renewables phase of your plan but this could be installed at any time. I have modelled for a total of 4 kWp of panels on the rear roof which is south facing. Solar PV can be less attractive for landlords because they do not benefit from 'free' on-site electricity but it would help reduce the tenants' electricity bills and have a significant effect on the EPC rating of the property.

The government no longer pay feed-in tariffs for solar panel installations but some energy suppliers pay small amounts for electricity exported to the grid (the Smart Export Guarantee) and this is likely to increase in the future. The electricity savings from solar PV will depend on how much of your tenants are able to use self-generated electricity on site. Heat pumps are powered by electricity so solar PV can help with their running costs. Other devices that help to maximise solar electricity use include:

- solar immersion devices that use your solar panels to heat hot water via immersion;
- Electric car chargers; and
- Solar batteries.

We tend to recommend solar PV ahead of solar thermal because the electricity has multiple uses within the house and can be exported to the grid. Solar thermal can be beneficial where there is a high and consistent demand for hot water but it requires more regular maintenance than solar PV.

12: Next steps



1: Review / Adapt

Let's set up a 30-minute phone call with your Retrofit Coordinator to discuss the report and its contents. If necessary, we can look at further upgrade scenarios and budgets for your property after signing the Client Service Agreement. **Please book your appointment by contacting support@cosyhomesoxfordshire.org.**

2: Additional Retrofit Coordinator Advice

If you require more than the 30-minute follow-up for discussion or research of questions you may have, you can agree to pay an hourly rate of £75 incl. VAT for additional time spent by your Retrofit Coordinator.

3: Client Service Agreement (CSA)

This agreement sets out how we will work together; what you need to do; and what we promise to do. It includes the price of the Building Performance Requirements and the administration of the quotation process.

4: Building Performance Requirements (BPR)

This document will include details about the measures that you have identified for inclusion in the works. It may include:

- Detailing of insulation at critical areas.
- Methods of installation to aid building contractors in price works and carry out construction.
- Consideration of how the heating and other systems must integrate with the whole building.

5: Get quotes

Once the strategy is settled, we will request quotes from trusted and pre-vetted contractors for your chosen package of works.

6: Review quotes

Your Retrofit Coordinator will run through the quotes including both the technical options and the prices.

7: Go ahead

If the quotes are agreeable to you, we will:

- Facilitate any contract documents that are required between yourself and the contractor.
- Coordinate the retrofit measures with the contractors to ensure they are appropriately sequenced.
- Oversee the works to ensure the contractor conducts what they have promised. We will be on hand to manage any issues or conflicts that may arise.
- Sign off the work and give you the all-clear to pay the contractor.

13: Appendix: All your options

Here is a list of everything that has been analysed.

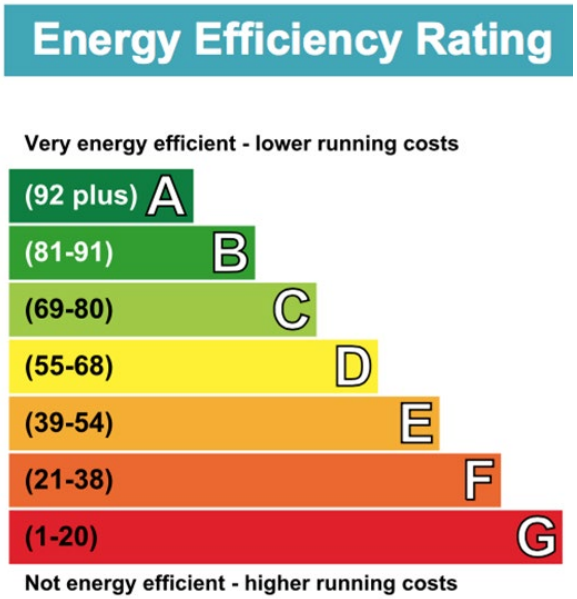
Please Note: Combined measures installed together usually achieve less savings than the sum of the individual measures set out below:

		Energy Rating			Estimated Fuel Bills			Kilograms CO_2		
Measures	Costs	Score	Saving	£/point	Bill	Saving	Payback years	Kg CO_2	Saving	£/kg CO_2
ASHP (45 degree emitters) with enhanced existing radiator central heating and hot water	£18,000	73 C	4.61	£3,905	£1,370	£-30	188	599	2,401	£7.50
ASHP (55 degree emitters) with existing radiator central heating and hot water	£18,000	70 C	1.73	£10,405	£1,510	£-180	508	661	2,339	£7.70
Cavity wall insulation and external insulation (100 mm) to empty pre 1976 cavity walls	£14,705	74 C	5.52	£2,664	£1,080	£250	126	2,300	701	£21.00
Cavity wall insulation and internal insulation (100 mm) to empty pre 1976 cavity walls	£14,810	74 C	5.52	£2,683	£1,080	£250	127	2,300	701	£21.10
External insulation (100 mm) to pre-1976 empty cavity walls	£14,164	73 C	4.95	£2,861	£1,110	£230	136	2,373	628	£22.60
Install PV system where potential has been identified	£7,400	88 B	20.05	£369	£670	£660	15	2,504	496	£14.90
Cavity wall insulation to 1950-1966 cavity wall	£1,338	71 C	3.30	£405	£1,180	£150	19	2,581	419	£3.20
Internal insulation to as built non-cavity alternate wall from unsheltered alternate wall	£6,459	71 C	2.59	£2,494	£1,210	£120	118	2,671	329	£19.60
External insulation (100 mm) to non-cavity first floor walls	£8,038	71 C	2.55	£3,152	£1,220	£120	149	2,676	324	£24.80
Full multi zone controls from full normal control set	£569	70 C	1.83	£311	£1,250	£80	15	2,779	221	£2.60
Insulated floors (50mm) from 1950-1966 solid floor	£7,118	69 C	1.04	£6,844	£1,290	£50	325	2,868	132	£53.90

Measures	Costs	Energy Rating			Estimated Fuel Bills			Kilograms CO_2		
		Score	Saving	£/point	Bill	Saving	Payback years	Kg CO_2	Saving	£/kg CO_2
Triple glazed windows from individual 2002 or later double glazed windows	£12,420	69 C	0.74	£12,911	£1,300	£40	564	2,905	96	£100.00
300mm loft insulation from 150mm	£2,067	69 C	0.49	£4,218	£1,310	£20	199	2,938	63	£33.10
New insulated front door	£2,500	68 D	0.21	£11,905	£1,320	£10	557	2,973	27	£92.40
Roof insulation (150mm) from As Built pre 1967 flat roof	£2,281	68 D	0.20	£11,405	£1,320	£10	523	2,974	26	£86.70
Cavity wall insulation to unknown party wall	£1,050	68 D	0.14	£7,500	£1,330	£10	345	2,982	18	£57.30
Humidity controlled kitchen extractor	£500	68 D	0.00	£∞	£1,330	£0	∞	3,000	0	£∞
Humidity controlled extractors per wet room	£500	68 D	0.00	£∞	£1,330	£0	∞	3,000	0	£∞
Trickle vents on windows	£180	68 D	0.00	£∞	£1,330	£0	∞	3,000	0	£∞
Humidity controlled passive ventilation to non-wet rooms	£300	68 D	0.00	£∞	£1,330	£0	∞	3,000	0	£∞
EPC House or Bungalow	£96	68 D	0.00	£∞	£1,330	£0	∞	3,000	0	£∞
Mechanical Extract Ventilation (Centralised)	£3,000	64 D	-3.85	£-779	£1,520	£-190	n/a	3,147	-147	£-20.40
Mechanical Extract Ventilation (Decentralised)	£3,000	64 D	-3.85	£-779	£1,520	£-190	n/a	3,147	-147	£-20.40
Mechanical Ventilation with Heat Recovery from Natural Ventilation	£4,000	59 D	-8.58	£-466	£1,770	£-440	n/a	3,267	-267	£-15.00

14: Glossary, References & Useful links

Glossary			
ASHP	Air Source Heat Pump	PV	Solar photovoltaic panels
EPC	Energy Performance Certificate	RHI	Renewable Heat Initiative
EWI	External Wall Insulation	SAP	Standard Assessment Procedure
FGHRS	Flue Gas Heat Recovery System	tCO_2	Tonnes of Carbon Dioxide
GSHP	Ground Source Heat Pump	TRV	Thermostatic Radiator Valve
IWI	Internal Wall Insulation	WWHRS	Wastewater Heat Recovery System
kWh	Kilowatt hours		



Fuel Bill Modelling

SAP models energy use based on 'typical' occupancy (assumed number of people living in your home, based on the floor area) and behaviour (e.g., heating the property to 21C in living areas and 18C elsewhere). The fuel bill figures and CO_2 consider your actual geographic location using historical weather data.

You may have a lower or higher occupancy than 'typical' in your home, and you may prefer heating your home to a higher or lower temperature than used in the model, which means your baseline energy use can be quite different to that which SAP models.

Furthermore, insulation levels are modelled on the age of the house if other evidence is not available, this will also impact on predicted energy use

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://stbauk.org/whole-house-approach/
Trustmark - PAS 2035	https://www.trustmark.org.uk/ourservices/pas-2035
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
SAP – Standard Assessment Procedure	https://www.gov.uk/guidance/standard-assessment-procedure

References	
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
SAP (Standard Assessment Procedure), RdSAP, Occupancy Assessment (OA)	https://www.gov.uk/guidance/standard-assessment-procedure
Clean Growth Strategy	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf
Catapult - Living Carbon Free	https://es.catapult.org.uk/report/net-zero-living-carbon-free/

cosy homes oxfordshire

Cosy Homes Oxfordshire
Unit 1, The Old Bakery, Sheep Street
Charlbury, OX7 3RR

Tv-5

01608 811160
0330 2232742
cosyhomesoxfordshire.org
support@cosyhomesoxfordshire.org

/cosyhomesoxfordshire
@cosyhomesoxon
@cosyhomesoxon