housewarming

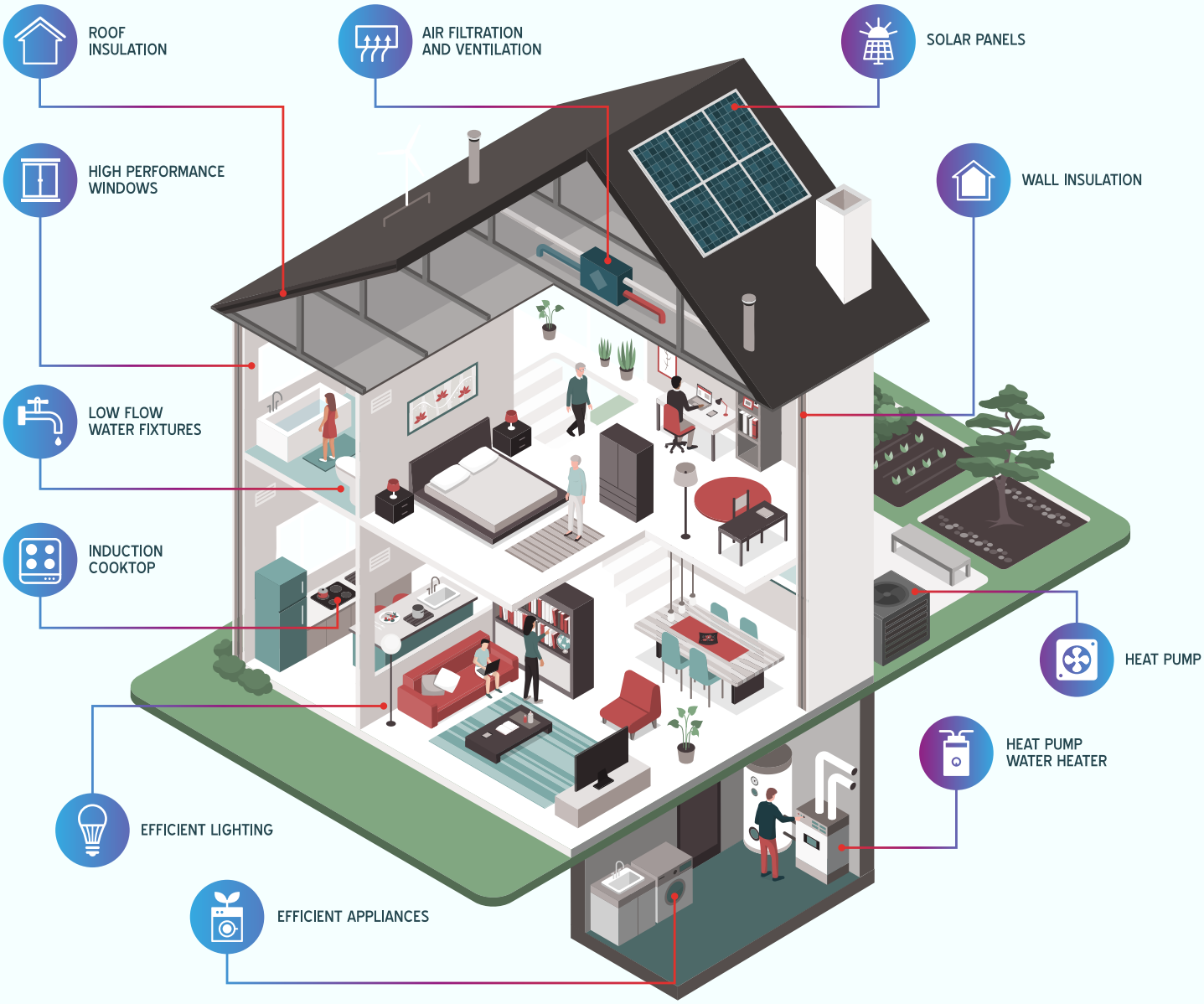
Guides

Taking Stock

Low Carbon Oxford North

housewarming

Cutting energy use in our homes



Low Carbon Oxford North

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WELCOME TO OUR FIRST HOUSEWARMING GUIDE

This is the first of a series of Housewarming guides created by Low Carbon Oxford North.

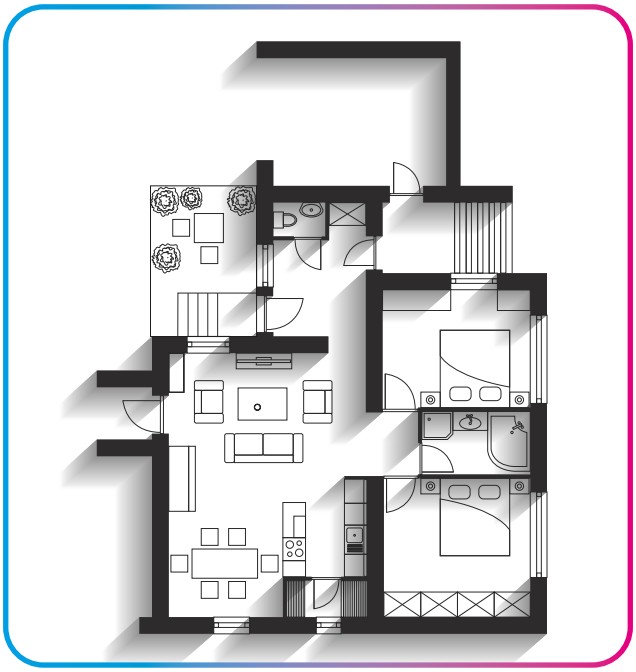
The Housewarming series focuses on cutting energy use by upgrading the fabric of our homes. 'Taking Stock' covers the beginning—helping you to assess the starting point in your own home. We hope that it will be useful, no matter how much you know already.

The guides will cover each of the core fabric areas in depth: insulation (roof, floor, walls); glazing and ventilation (windows, draught proofing, mechanical ventilation). We will also consider heating and cooling (including heat pumps and controls); and renewable energy (including solar PV). Our sixth guide will explain how to prepare a complete retrofit plan. Core within them all, is a focus on reducing gas use for heating and hot water as this is where the greatest long term carbon and financial savings can be made.

We are conscious that the sheer volume of advice and expertise available on the internet alone can be overwhelming. The Housewarming series is designed to help homeowners understand the main elements, measures and choices involved in each of the areas of retrofit work that you might need. It will provide basic knowledge and frameworks to help you weigh up the many options you will have and to decide how best to reduce your home's energy consumption and carbon emissions.

You will also find suggestions for immediate energy savings in each of the guides, as there are simple things you can do straight away to reduce your energy consumption before you even start talking to specialists or embarking on retrofit work.

This guide was written in Spring 2022 and focused on Oxford, but we hope it will have relevance for a wider geography and over time.



This guide will review each aspect of your home.

INTRODUCTION

CUTTING ENERGY USE IS A GROWING NEED FOR US ALL

- **Energy costs are unlikely to fall back to 2020 prices**

Through 2021 to 2022 we saw energy prices rise very steeply as global market prices rose dramatically. Experts suggest they will never fall back to 2020 prices and so it makes sense to reduce your energy needs.

- **Government regulation is tightening**

Privately rented properties are already required to meet minimum EPC 'E' levels. In addition, the government would like all homes to reach EPC level 'C' by 2035 (and rumours abound that this might soon become a minimum requirement before any homes can be sold).

'Cutting the cost of living with a green economy: Improving home energy efficiency has a big impact on energy bills' www.green-alliance.org.uk.

- **Cutting carbon emissions**

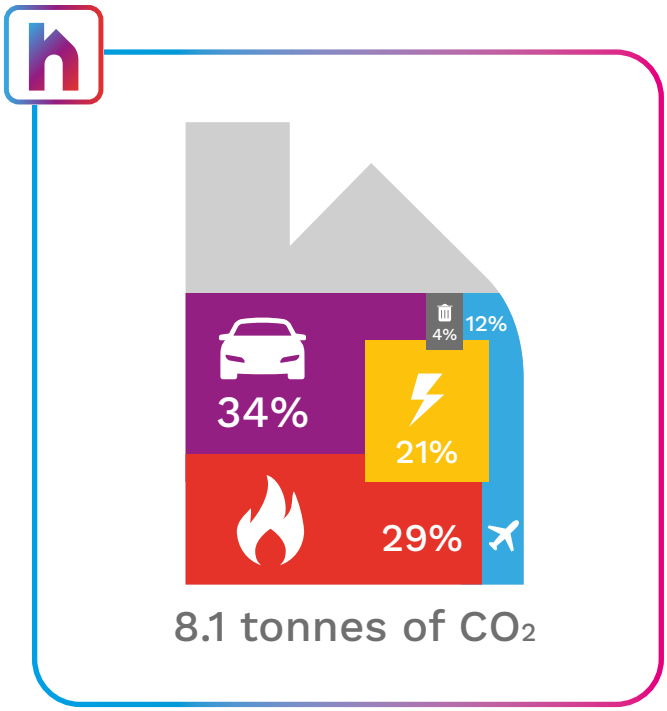
Households contribute around 50% of UK carbon emissions and just under a third of that is from gas heating (Committee on Climate Change 5th Carbon Budget). Cutting home energy use will help cut our personal carbon emissions. Without it Oxford City Council targets to reach net zero by 2040 will be difficult to achieve.

- **Phasing out fossil fuels**

The government is yet to set a strategy for which homes could have 'green' hydrogen fuel for heating in the future. Other possible options include biogas, or other green gases. However, the most common heat source is likely to be electric heat pumps either for individual homes or in district heating. With grid electricity coming from renewables and nuclear power, heat pumps are the lowest carbon means of heating.

- **A well-insulated home is a warmer, healthier more comfortable home**

The best way to future proof our homes is to adopt a 'fabric first' approach. British homes are some of the leakiest in Europe, and therefore the hardest to keep warm. If you make your home more energy efficient, you will need a smaller heat pump, which will need less electricity to run, saving money and carbon emissions. We cover heat pumps in greater detail in a later guide.



29% of UK household carbon emissions are from gas heating, 21% from electricity.

WHY NOT FIT A HEAT PUMP IMMEDIATELY?

Heat pumps use electricity to harvest heat from their surroundings. An Air Source Heat Pump (ASHP) takes heat from the air and a Ground Source (GSHP) from the ground.

If correctly designed and installed, you will get around 3 to 4 times as much heat from the system as the electrical energy that goes in. Heat pump technology is well advanced and thoroughly tested—heat pumps have been used in many parts of the world for decades.

In an urban area it is very unlikely you will have enough space for the horizontal pipes or boreholes that a GSHP uses to gather heat from the ground. An air source heat pump is about the size of a large fridge and will generally be mounted on the ground outside your house.

It does not make sense to replace a gas boiler with a heat pump without first improving the insulation of your home. This is because:

- An uninsulated home will require a bigger and more expensive heat pump.
- This large heat pump may be too big for your electrical supply.
- It will be more costly to run.

If your home is very 'leaky' the heat pump may not be effective without insulating your home first. Many homes are likely to need radiators roughly twice as big as existing ones because a heat pump produces 'warm' as opposed to 'hot' water, and so gives out lower levels of heat. However, if you insulate your home to reduce the heat needed by half then your existing radiators should normally work with a heat pump (although you will need a suitable hot water tank). A smaller heat pump will cut installation costs and your running costs, as you will be buying less electricity.

Heating your home with a properly installed heat pump will produce heat at about a third of the cost of the electricity to power it, whereas a gas boiler will produce heat at about 10% more than the cost of gas burnt. With current energy prices of 34 p/kWh for electricity and 10 p/kWh for gas this means a properly installed and set up heat pump will provide heat at about the same annual cost as a gas boiler.

The heat pump will reduce carbon emissions by about 60% now compared to the boiler, even before improving your home, but if you have also halved your heating needs by upgrading the fabric of your home, your carbon emissions will be reduced by around 80% and your fuel bills should be lower.

That is why this guide mainly focusses on improving the fabric of your home, so it is 'heat pump ready'—ready to benefit fully from the smallest possible heat pump, with comfortable temperatures and significantly reduced emissions.

WHERE TO BEGIN

Although our homes may have much in common with our neighbours, small differences could mean different decisions may be needed in your own home compared to next door.
You may be wondering 'But where do I start?' 'What makes the most difference?' 'How much could I do myself?' 'Can I improve my home bit-by-bit or does it have to be done in one go?'

A good place to start for any homeowner is to gather the answers to these questions:

1. How is energy used in my home and how does that compare to others?
2. What kind of home do I have and have there been any major changes over time—for example, extensions?
3. What kinds and quality of energy efficiency measures do I already have installed?
4. Are there areas I already know I would like to improve—damp patches, condensation, draughty areas, cold spots?
5. Are there possible constraints—for example, living in a conservation area?

STEP ONE

SET YOUR OWN TARGETS

It helps to set a target upfront to reduce your electricity and gas consumption in your home—a 50% cut of all heating and electricity used might give a clear starting point against which to consider the various options. This would include electricity used in lights and appliances.

HOW MUCH ENERGY DO YOU USE?

UK household energy consumption in kWh ('units') was reported by OFGEM in 2020 as per the table below:

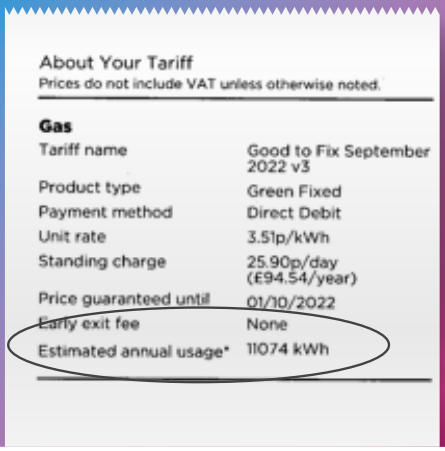
	Gas (KWh)	Electric (KWh)	Approx. Annual Bill (£ in 2020)	With Expected 54% Increase (£)
Low	8,000	1,800	~700	~1,078
Medium	12,000	2,900	~800	~1,232
High	17,000	4,300	~1,400	~2,156

Average Household Energy Consumption—OFGEM 2020 published figures.

TAKE A LOOK AT YOUR OWN ENERGY BILLS

These will show you how much energy you use. Of course, our bills have gone up since 2020 as the price of energy rises. OFGEM has stated that from 1 April 2022: “Those on default tariffs paying by direct debit will see an increase of £693 from £1,277 to £1,971 per year”. That is a 54% increase. Focus on the **kWh annual energy** use.

Your annual estimated energy use will be recorded on your energy bills—or reported online if you don’t have paper bills.



About Your Tariff

Prices do not include VAT unless otherwise noted.

Gas

Tariff name	Good to Fix September 2022 v3
Product type	Green Fixed
Payment method	Direct Debit
Unit rate	3.51p/kWh
Standing charge	25.90p/day (£94.54/year)
Price guaranteed until	01/10/2022
Early exit fee	None
Estimated annual usage*	11074 kWh

What is a kWh?

This is the ‘unit’ of energy we pay for in our bills. For electricity it is the number recorded by the meter; for gas a conversion factor must be applied as the meter measures volume (in cubic meters or cubic feet). If your meter or bill shows a measure in cubic metres (m^3) then multiplying by 11 is close enough to kWh (your bill will show the correct conversion on it).

A **kWh** is also what you use if 1 kW of power operates for 1 hour. Ten kWh would be used by 5kW device running for 2 hours. So, if your gas boiler is rated at 20kW and ran for about 600 hours at full output you would use 12,000 kWh. That might be for an average of 6 hours per day for 100 days (of course how exactly a boiler operates is more complex, but this is the principle).

A 100W lightbulb running for 10 hours uses 1000Wh or 1 kWh.

Similarly, a typical laptop in use for 8 hours a day uses about 1 kWh in a week.

TOP TIP: Focus on your energy use—your kWh —in your target reductions

Accurate bills need regular meter readings. Some of you will do this yourself. Monthly readings are good enough for most purposes, though weekly can be helpful. If you have a smart meter, it will be read automatically, and your readings will be available online. Some of you may have an 'estimated' reading (this should be stated on your bill next to the figures) on your bill as the energy supplier has not read your meter. This is unhelpful as you do not know how much you are actually using, and your bill is probably averaged out over the whole year with 1/12th charged each month. This might help with budgeting, but you might not realise how much you use in winter compared to summer. If this is the case for you, start recording your monthly meter readings and report them to your supplier!

The energy supplier is not responsible for the accuracy of your meter readings, you are. If your meter readings are under-reported and you are not paying enough and get behind with payments, then the responsibility is yours not the energy suppliers.

Once you have a good few monthly readings you can start to monitor energy use. Keeping a record in a spreadsheet will allow you to plot charts and look for trends.

Read your meter

Read your meter each month and make sure your energy suppliers get this reading. Citizens Advice has a great guide on how to do this.

www.citizensadvice.org.uk/consumer/energy/energy-supply/your-energy-meter/how-to-read-your-energy-meter/

This means your bill will reflect what you actually use – not an estimate. It also means you can keep track of how it changes with the seasons and the weather—and how much it goes down when you improve your house.

Generally, the bigger and older your house, the more energy you will consume. However, other factors such as how many baths and showers the family has, when the heating comes on and how high your thermostat is set make a difference. However, a better insulated, more energy efficient home will always use less.

TOP TIP: Make sure your meter readings are accurate. Understand your own usage.

THERMOSTAT SETTINGS

The Energy Saving Trust says, “The thermostat should be set to the lowest comfortable temperature, typically between 18°C and 21°C”.

Of course, some people may need a warmer building but in general this temperature range is a good start. Turning the thermostat down by jut 1 degree should save about 10% of your heating bill (Uswitch and Energy Saving Trust).

It is a myth that having the heating on constantly during the day is more efficient than switching it on and off. You should only heat the rooms you are using and the house when it is occupied. The minimum you should have in a heating control system is a time clock, to set when the heating comes on, plus at least one room thermostat which controls how warm the house gets when the heating is on. You can get electronic thermostats that let you set different temperatures at different times of day.

All radiators should also have **Thermostatic Radiator Valves (TRVs)** which mean each room can have a maximum set temperature when the heating is on. With these it is a simple job to turn down the temperature in unused rooms.

There are also several smartphone apps to connect to smart room thermostats including the well-publicised Hive and Nest. A quick search of the internet shows there are 4 or 5 direct alternatives as well as a larger number of similar devices you can programme from within the home. These can be helpful in avoiding energy wastage but are not a substitute for a well-insulated home.

Thermostatic Radiator Valve

A Thermostatic Radiator Valve (TRV) is like an automatic hand to turn the radiator off when the room is warm enough and on again if it gets too cold. You set the chosen temperature by turning the knob to a particular number on the TRV, then leave it to do the work. It is an important part of a good heating control system. When the room is cold, the valve opens and, if the boiler is on, hot water flows through the radiator. As the room warms up so the valve turns the radiator off. You can now buy some types which you can control via smartphone or computer app. This allows you to have different ‘target’ temperatures across different times of day and to turn the heating in that room on or off remotely if you change your plans.

STEP TWO

RATE YOUR HOUSE

Energy needed for heating is usually the biggest source of carbon in your home and the one you can reduce the most. Find out if your house is draughty and in need of some basic energy efficiency tweaks.

You could start with an Energy Performance Certificate (EPC, the certificate with the rainbow bar chart that every house on sale or for rent must have). Most houses will already have an EPC. If so, you will find it online here:

www.gov.uk/find-energy-certificate

EPCs are not perfect and often contain subjective judgements but they are a start. How they were done has changed over time so an old one is not as useful as a new one. It may be that an EPC for your house was done before you made some changes, such as adding a conservatory, in which case it is no longer accurate. Also, they often overstate carbon from electricity and have not yet taken higher energy prices into account. An EPC is based on the energy used for space and water heating and fixed lights, per m^2 of floor area.

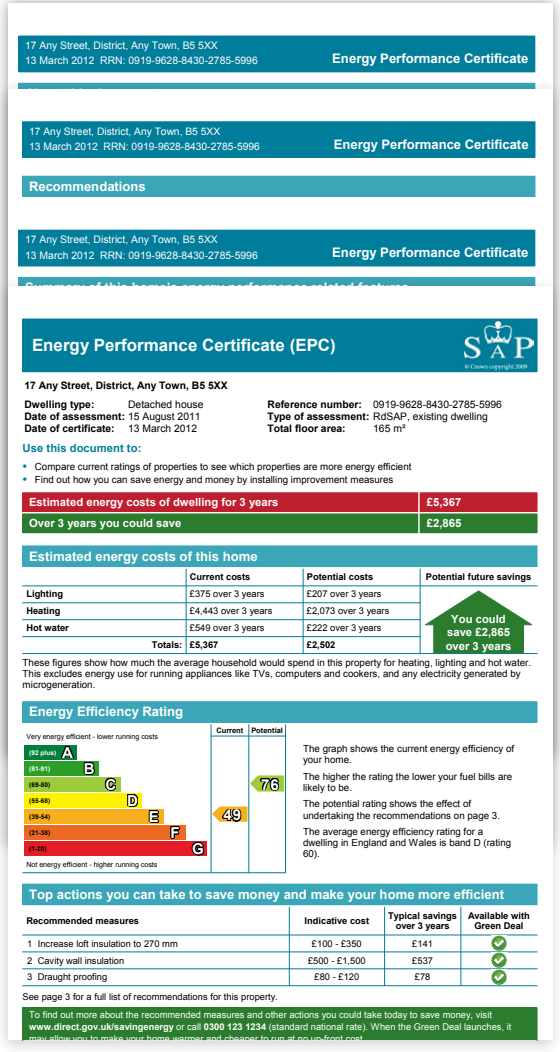
However, an EPC should help with some basic information. Recent ones give a star-rating out of 5 in a table entitled "Summary of this home's energy performance related features". They will include:

1. What is the floor area in square meters (m^2)
2. Does your house have a cavity wall and is it insulated?

Energy Performance Certificate

Every house must have an EPC when it is sold or rented out. **Rented properties MUST be EPC 'E' or better** (since April 2020) or cannot be rented.

Future changes being discussed might mean **no house can be sold unless is it EPC 'C' or better.**



17 Any Street, District, Any Town, B5 5XX
13 March 2012 RRN: 0919-9628-8430-2785-5996 Energy Performance Certificate

17 Any Street, District, Any Town, B5 5XX
13 March 2012 RRN: 0919-9628-8430-2785-5996 Energy Performance Certificate

Recommendations

17 Any Street, District, Any Town, B5 5XX
13 March 2012 RRN: 0919-9628-8430-2785-5996 Energy Performance Certificate

Energy Performance Certificate (EPC) SAP

17 Any Street, District, Any Town, B5 5XX

Dwelling type: Detached house
Date of assessment: 15 August 2011
Date of certificate: 13 March 2012
Reference number: 0919-9628-8430-2785-5996
Type of assessment: RdSAP, existing dwelling
Total floor area: 165 m²

Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient
- Find out how you can save energy and money by installing improvement measures

Estimated energy costs of dwelling for 3 years	£5,367
Over 3 years you could save	£2,865

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£375 over 3 years	£207 over 3 years	You could save £2,865 over 3 years
Heating	£4,443 over 3 years	£2,073 over 3 years	
Hot water	£549 over 3 years	£222 over 3 years	
Totals:	£5,367	£2,502	

These figures show how much the average household would spend in this property for heating, lighting and hot water. This excludes energy use for running appliances like TVs, computers and cookers, and any electricity generated by microgeneration.

Energy Efficiency Rating

Current Potential

Very energy efficient - lower running costs
(92 plus) A
(81-91) B
(69-80) C
(55-68) D
(39-54) E
(21-38) F
(1-20) G
Not energy efficient - higher running costs

49 (Current) 76 (Potential)

The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The potential rating shows the effect of undertaking the recommendations on page 3.

The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

Top actions you can take to save money and make your home more efficient

Recommended measures	Indicative cost	Typical savings over 3 years	Available with Green Deal
1 Increase loft insulation to 270 mm	£100 - £350	£141	
2 Cavity wall insulation	£500 - £1,500	£537	
3 Draught proofing	£80 - £120	£78	

See page 3 for a full list of recommendations for this property.

To find out more about the recommended measures and other actions you could take today to save money, visit www.direct.gov.uk/savingenergy or call 0300 123 1234 (standard national rate). When the Green Deal launches, it may allow you to make your home warmer and cheaper to run at no up-front cost.

3. How well is the loft insulated?
4. How efficient is your heating system?
5. Do you have the best heating controls?
6. How good is your double glazing?

These will also be the first stepping stones towards becoming heat-pump ready.

Rating your house using an EPC plus additional checks and information will help you start identifying the main easy steps to reducing energy consumption and carbon emissions. These will also be the first stepping stones towards becoming heat-pump ready.

It won't tell you how **draughty your home** is, nor will it know as much about your house as you do!

If you don't have an EPC you could:

- Ask a recommended assessor to do an EPC survey (this may cost £50 or more).
- Ask a recommended energy surveyor to do a more comprehensive house survey (around £500 for a three or four-bedroom house).
- Begin yourself. **We have given you a template checklist** at the end of the guide.
- Consider where draughts come from in your home and where hot air leaks out (including open fireplaces and the loft-hatch).
- Consider if there are places where you get condensation, or damp.

What to expect from a Whole House Plan energy survey

The minimum you should expect from an energy survey is:

1. Review of energy bills plotting charts by month or week showing trends and using degree-day analysis over at least 12 months and ideally 2 years. This needs actual meter readings NOT estimates (could be smart-meter data online).
2. Inspection of the building recording types of fabric and inspection of windows to determine age. Assessment of insulation levels and likely U-values for all fabric.
3. At least a basic set of floorplan sketches for all rooms (these may be from estate agents' details) showing dimensions.
4. Photographs of key points of interest e.g. holes where draughts are entering or depth of loft insulation.
5. Broad estimates of where the heat is going and some commentary on what is using electricity. Comparison with UK norms and averages.
6. Good indication of how much energy and cost will be saved by suggested insulation improvements. Likely new U-values from suggested improvements. Comparisons of the different measures and their impact on running costs and carbon emissions.

An even better level of survey would include some thermal images (ideally taken in cold weather – at least 10 degrees difference between inside and outside), investigation and adjusting of boiler settings, measurements of wall thicknesses in several places, and a review of any available drawings e.g. for an extension.

The above survey differs considerably from an EPC which generally assumes U-values according to the age of the building and without any significant detailed inspection. Typically, an EPC survey would take about an hour whereas a better survey would take at least half a day.

You can help the energy surveyor make the best job on their visit by gathering relevant information you already have. This would include:

- Boiler manual.
- Double Glazing installation certificate.
- Receipts for any insulation installed including cavity wall.
- Building regulations drawings and specifications for any extensions.
- Information about any solar PV installed.

We will provide more detailed guidelines on specific aspects of energy efficiency in LCON's other Housewarming guides. These will help you understand your house, make improvements yourself or decide on bigger changes that will need a contractor.

Heat Pumps

A few houses and flats may be heat-pump ready as they are. Generally, these will be smaller and either modern build or fully refurbished with energy efficiency as a key aim. If your EPC rates your house as A or B and the area is less than 100m^2 you may be able to fit a heat pump in place of a gas boiler. This is even more likely if you have underfloor heating and Mechanical Ventilation with Heat Recovery (MVHR—we will cover this in a later guide). This would be subject to various detailed checks, including the need for some new radiators and a new hot water tank.

STEP THREE

TAKE THERMAL IMAGES

Thermal images can really help you to understand where the warm and cold spots are in your home and where it is leaking heat. You may already have an idea of these, but the addition of thermal images can help you identify why. Taken inside the house on a cold day (the colder the better but a minimum of 10° C difference between inside and out) a thermal image typically shows warm areas in orange and cold in dark blue. Such images are really good at spotting small features that could be improved. If used outside on a cold day, they can also show where heat is leaking out.

There are many thermal imaging cameras available. Some can be connected to a smart phone. They all work in broadly the same way: everything gives off some 'infra-red' light and the thermal imaging camera detects this and displays it as colour (and often with a temperature figure).

It is best to do thermal imaging with someone who has done it before or is an expert. Local community groups might have a camera to share.

TOP TIP: The colours show comparative cold and hot, so be careful what you include in the image. If you include something hot like a freshly boiled kettle your entire room will look cold in comparison and the measure won't be useful.

Thermal Imaging

In the image below, we can clearly see a cold draught leaking around the door edge and a 'cold bridge' where a poorly insulated part of the wall meets the ceiling—both shown by dark blue. The draught around the door can be stopped and the cold bridge should be insulated if possible.

The image below, taken from outside, shows hot air coming out of 'trickle vents' at the top of the window shown by the bright yellow/white colour. There must be a lot of cold air getting in on the ground floor to replace it!

STEP FOUR

DRAUGHTS, AIR TIGHTNESS AND AIR QUALITY

Heat is lost through solid surfaces like walls, roof, floor, and windows by conduction, just as heat is lost from a teapot. Separately, there is ventilation from fresh air coming in and therefore warm air leaving our homes. In a reasonably well insulated home, these 'air changes' contribute about half the heat loss. In the best designed and built houses, 'passivhaus' (www.passipedia.org/certification/enerphit), the building is extremely well sealed. A system to provide fresh air whilst recovering heat is used, called Mechanical Ventilation with Heat Recovery or MVHR. At the other end of the scale, an old Victorian house with rattling sash windows will have lots of draughts and huge heat loss from ventilation.

Fresh air is of course important. We breathe out CO_2 and moisture, cooking releases fumes and moisture, showers create steam and new plastics such as in carpets give off potentially toxic volatile organic compounds (VOCS in which the 'organic' is as in organic chemistry not as in healthy 'organic' food). The general advice is that 'one air change per hour' is necessary to keep a home fresh and healthy. (This isn't a helpful measure, but it is a guide.) Extractor fans in bathrooms and kitchens are important because they blow the stale, steamy air out of the house, although this will mean that cold air is drawn in somewhere else.

MVHR are newer types of fans and whole house ventilation systems that extract the stale warm air, bring in fresh air and pre-warm it with the waste heat from the stale air via a heat-exchanger. Some types of MVHR can be fitted in a conventional home—we will cover this in a later guide. The easiest and most effective place to put these in an existing home is to replace extractor fans in bathrooms. These operate as the extractor fan does but extract stale air from the room and replace it with pre-warmed fresh air in the same room.

Heat is lost through solid surfaces.

When we improve the insulation of our homes, we need to think about reducing draughts but also ensuring ventilation. New double or triple glazing may have 'trickle vents' fitted as per building regulations to ensure this happens.

You could use a CO_2 meter and measure the current levels of air quality in your house. If they often exceed 800 ppm (parts per million) then you probably do not have enough ventilation.

You must always have recommended maintenance and safety checks on combustion appliances such as gas fires, to make sure they are safe and not emitting carbon monoxide.

If you have an appliance that replies on combustion (for example a wood burner), depending on the size of it and when it was installed, it may be relying on your house to have good ventilation to remain safe.

Please make sure you take professional advice on ensuring you have good ventilation in the home after any improvements, including significant draught proofing.

CO2 Meters

A CO_2 meter measures the amount of the gas CO_2 in the air around it. Outside it is about 450 parts per million (ppm). Inside a building the amount depends on how much ventilation there is, how many people are inside and how active they are. Generally, the amount of CO_2 also indicates the number of other pollutants and moisture—how stale the air is. The guideline limit for CO_2 is 1000ppm and in Denmark they say 800ppm implies good air quality.

Example CO_2 meter from duomo.co.uk/product/aranet4-sensor-home/

STEP FIVE

UNDERSTAND WHAT IS CONTRIBUTING TO YOUR ENERGY USE

As we saw earlier, average electricity use is around 2900 kWh per year—but high use is around 4300 kWh per year. If you have an electric hob, oven, and plug-in electric car this might be even higher. Generally, electricity consumption is much more constant than energy for heating. There is a small increase in winter for lighting (and a few electrical bits in the boiler) but otherwise electrical appliances and loads like the kettle, microwave and wifi will generally not be used very differently. It is important to know that your electricity bill is made up of this mixture of loads.

A small load that is on all year can use as much or more than a large load used every now and then. For example, if you have a 10W wifi router on all the time it might use about 100 kWh per year (about £18). This is the same amount as using a 3 kW kettle for five and a half minutes every day. Cooking a full Sunday lunch in an electric oven probably costs about £1.

The energy ratings of household appliances have recently changed. Manufacturers had got too good at being 'A', A+, A++ or A+++ rated after 25 years. So, the old 'A' rating is now classed as a 'D'. See:

www.energylabel.org.uk

TOP TIP: When you need to replace your old appliances choose the highest rating new ones.

This is to encourage further advances in energy efficiency. If you have an old D rated fridge it probably makes sense to replace it with a new one that is more energy efficient.

TOP TIP: Switching things off at the wall does make a difference—it avoids the standby load 24 hours a day. Even if this is small, it can add up to a lot over the year. Make sure you turn off standby on TVS, and don't leave your electronics charging once they are at 100%.

OTHER THINGS TO CONSIDER UPFRONT

PLANS

For very many houses you can find estate agent's plans online or you may have kept a copy when you bought your house. You can, of course, draw your own plans; think about what is above or below any room, where the basement extends to, and where your external walls are as these aspects are important.

If you have had extensions, you may have a set of detailed drawings for these. If you don't have a copy, you should be able to get hold of plans related to any planning applications for your house. These can be found from the Council's planning section on their website. A search by your address should identify any and they can be downloaded. You will rarely find detailed building regulations drawings, but the planning drawings will help, and detailed drawings may have been completed by the same company that drew the planning drawings and they may well hold archive copies.

BASIC MAINTENANCE

It is always sensible to keep up with basic maintenance of your property. When it comes to energy efficiency enhancements it is important to ensure the building is in good condition. For example, if a gutter has been overflowing and the wall is frequently damp this will have to be fixed in time for the wall to dry out before external wall insulation is fitted. Similarly, if the damp proof course has been bridged (essentially built across or buried in soil) then the wall will suffer rising damp which will get worse if insulation is fitted.

OTHER BUILDING IMPROVEMENTS

It makes sense to carry out energy efficiency upgrades when other enhancements are done, for example putting in a new kitchen, building an extension or putting in a loft conversion. This means that any decorating need only be done once.

CONSERVATION AREA OR LISTED BUILDINGS

If you are in a conservation area or the building is listed you may need permission for various modifications to your house including external insulation, solar panels, or a heat pump. You should discuss this with the council before proceeding.

EXISTING HEATING SYSTEM

Start gathering information on the existing heating system. You should have instruction manuals for the system which may help you set it up optimally; if you don't have paper copies you can usually find electronic copies online from the manufacturer's website. Information about the efficiency of a boiler, its age and peak output. You should find out how much underfloor heating you have and make a note of the size of each radiator and if it is single, double, or finned (you can find images to show the difference online).

HOT WATER TANK

If you currently have a combination (combi) boiler this normally supplies hot water instantly rather than storing it in a tank. A heat pump cannot do this and so you will need a suitable hot water tank. Think about where you would put a hot water tank if you had to get one. A loft is a poor location as it will be cold and increase the heat losses from the tank and all the pipes that run to and from it.

Even if you have a hot water tank, to use a heat pump to provide hot water you will need a heat pump compatible tank. This will have a suitably designed heat exchanger inside and so will be bigger than a tank heated by a boiler or electricity. A typical tank would be 50% larger in volume, so think about where this would go – would it fit where your existing tank is located?

IMPROVING BIT-BY-BIT

It is perfectly reasonable to improve the insulation and draught-proofing room-by-room or to install loft insulation one year and wall insulation the next. Individual improvements will each make a difference and are 'stepping stones' to the final 'heat-pump ready' home. Some care might be needed in a solidwall house as one room will suddenly be much warmer than the others and this might promote condensation in the colder rooms. However, if ventilation is good, this is unlikely to be a problem.

TOP TIP: Make a whole house plan before you start with improvements. This will help prevent you having to redo work later or double costs for example paying for scaffolding or decorating.

COLLECT EVIDENCE OF IMPROVEMENTS

Remember that it will be increasingly important in future to provide evidence of improvements to the energy use in your home, for a future EPC rating, for example. We suggest you start to keep a file of evidence of any surveys, designs, specifications, bills and photographs of what is being or has been done.

CHECK BUILDING REGULATIONS

If you are doing significant amounts of upgrading, you will almost certainly need to comply with The Building Regulations. These were substantially updated in June 2022 and several sections apply to work relevant to Housewarming, including:

Part F	Ventilation,
Part G	Sanitation, hot water safety and water efficiency
Part J	Combustion appliances and fuel storage systems
Part L1A	Conservation of Fuel and Power

The last Part, L has the most relevance.

Two new sections were added in June 2022 with forward-looking aims:

Part O	Overheating
Part S	Infrastructure for charging electric vehicles.

Where the regulations require it you and your contractors must comply.

The latest versions can be found online:

https://www.gov.uk/government/collections/approved-documents

SUMMARY

- Get out your energy bills and see how much you use per year.
- Read your meters at least monthly so you can see how this varies summer to winter.
- Compare this with your friends and neighbours and with the UK average.
- Get a floor plan of your house and make notes about the energy related features.
- Rate your house – start with an EPC if you have one and add to this with our Housewarming self-survey checklist.
- Find someone locally who has used a thermal imager and have a look at your house.
- Borrow a CO_2 monitor to check indoor air.

MEANWHILE, YOU CAN ALSO:

- Find the draughts and do some draught proofing.
- Consider whether you can adjust your thermostat or heating settings.
- Turn off unused electrical devices.
- Ensure basic maintenance of the building is up to date.
- Use our Housewarming self-survey to record your findings so far (at the end of this guide).

Our later guides look more closely at each of the core retrofit areas in turn. We hope that these will give you the language and understanding to begin to put together your own jigsaw of works to achieve a pragmatic solution to upgrading your home - whether you decide to do this as one whole house retrofit or as a series of smaller works. Whichever you choose, make sure you start with a plan for the whole house and focus on upgrading the fabric of your house to cut your whole energy use before you add renewables or a heat pump.

Our later guides will look more closely at every aspect of energy efficiency in your home.

DISCLAIMER

This guidance document is written with the intention of providing a better basis for home owners to decide how to reduce the energy consumption and carbon emissions of their homes.

We have not surveyed your home and so the suggestions and discussions in this document can only be a general guide and LCON and its consultants cannot be held responsible for or accept any liability for damage, failures or disputes which result from the use of this document.

We recommend that specific decisions are made only after a suitable survey by an appropriately qualified specialist.

We recommend gaining several quotes for work from a number of suppliers and suitably qualified and experienced companies with appropriate insurance.

It is essential to follow material manufacturer's instructions and specification sheets to avoid risks of damage to structure and property and to ensure the intended performance is achieved. We recommend the use of only those products with appropriate independent certification for the intended use e.g a BBA (British Board of Agreement) certificate.

We recommend appropriate contracts are used and signed by all parties before work is undertaken and suitable legal advice should be sought.

CREDITS

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The Housewarming series has been created for Low Carbon Oxford North by Jane Grindey, written by Tony Duffin of Corrie Energy and supported by Dr. Brenda Boardman.

ANNEX

SELF-SURVEY YOUR HOME

The template below can help you capture your investigations into your home as it stands now. You will be establishing your own home's starting point. This will help you to decide on your priorities when you are ready to begin the task of upgrading your home.

1. YOUR ADDRESS

2. BRIEF DESCRIPTION OF YOUR HOME

When was the house built? What kind of roof and windows does it have? How many floors, rooms? What kind of materials is it built from that you can see? Is it listed or in a conservation area?

CONSIDER YOUR HOME

Are there rooms that are colder or hotter? Are there any obvious issues that will require repair - for example condensation, damp, mould, leaking roofs, or rotting timbers? You will be able to begin to identify the key areas where work will be required and some aspects that could be improved quickly and even as DIY projects.

Do you have a floor plan? If no, can you sketch one?

DOES YOUR HOME HAVE A VALID EPC?

Find it online here: www.gov.uk/find-energy-certificate

3. ANNUAL ENERGY USE

(We have described m^3 gas units on the meter conversion to kWh earlier in the Taking Stock document. Other fuels should all have conversions to kWh on the bills, if formally purchased.)

Gas kWh /year.....Electricity kWh/year.....

(Use meter readings, not estimates from your bills.)

It helps to set a target upfront as to how much you would like to reduce your electricity and gas consumption—a 50% cut in your gas/heating might give a clear starting point against which to consider the various options to improve your home.

You can use the templates below to start to make an energy record of your house. This should help identify where your house sits on the spectrum from poorly insulated to passivhaus.

ENERGY TEMPLATE

Monthly meter readings
Year 1 (Start by looking back 12 months from when you begin to record the figures, continue until the new year):

Month	Gas (kWh)	Electricity (kWh)
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Continued:
Year 2.

Month	Gas (kWh)	Electricity (kWh)
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

TEMPLATE FOR RECORDING YOUR HOMES' BASIC FEATURES—WALLS, WINDOWS, FLOORS, ROOFS

Take a good look at each of the rooms in your home and capture some basic details.

Features and Fabric	Notes and Descriptions
External Wall Do you know what type it is? If you know it is a cavity wall, do you know if it has been filled and if so, when? Is the wall rendered or pebble-dashed? Are there different types of walls around the building? Has the building had any extensions, if so, when? Do you share walls with your neighbours (semi-detached or terraced)?	

Ground Floor Solid or suspended timber, or a mix? Has it had any insulation, if so, what, and when? If timber floorboards, are the gaps between the floorboards sealed?	
Roof Pitched, tiled? Flat? Perhaps estimate what proportion of each if a mix?	
Glazing Do you have single, double, or triple glazed windows? Or secondary glazing? If a mix, what proportion of each? When was it installed (look around the glass frame for a date on your double or triple glazing)? Do you have a FENSA certificate from the installation?	
Heating system Brief description; gas/oil/electric? When was the boiler last replaced? Do you have radiators or underfloor heating, or a mix? What controls do you use (for example a central thermostat, TRV's on the radiators)? Do you heat your hot water on the same system? Do you have a hot water tank on the same system? If so, is it lagged?	

While you are considering your house, the below is for capturing notes relating to **possible future plans:**

Future Features	Notes and Descriptions
For Solar PV Is there access to the roof? Does the roof face broadly between Southeast and Southwest? Is there any obvious shading (e.g., trees, chimneys or nearby buildings)?	
Internal Space Is there space for a large hot water tank? Could room sizes accept being smaller (internal insulation)?	
External Space Where is there space for an Air Source Heat Pump outdoor unit (large fridge size)? Is there easy access for scaffolding to roof e.g., for glazing or solar PV? Are there other access issues—e.g., difficult side-slopes, access for contractors' vehicles, public footpaths?	

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