

HOUSEHOLDER ENERGY EFFICIENCY MANUAL



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HOUSE TYPE

Timber Frame House

CASE
STUDY
4

How can you make your home more comfortable and efficient?

*This document provides specific guidance to those of us who live in **timber frame** type houses, and lists measures for saving energy, cutting fuel bills, making your home more warm and comfortable and reducing your environmental impact.*

Together this reduces our vulnerability individually and as a community to change - be that increasing energy prices or cold weather - whatever type of house you live in.

The energy saving measures are split into 3 groups:

- ▶ **FREE, EASY TO DO**
- ▶ **LOW COST DIY MEASURES**
- ▶ **HIGHER COST OR INVESTMENT MEASURES**

There are many effective changes you can make, either one by one over time, or all together.

CONTENTS

● Introduction2	● Higher cost and investment measures 9
● What is your house like now?3	● Fuel types 11
● Hints and tips4	● Upgrade case study13
● Free and low cost measures5	● Where to get more information 14
● Low cost and DIY measures6	



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page 4 Insulation can be easy to install yourself



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page 8 New low energy light bulbs can give great light.



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page 12 Dry logs are a great low carbon fuel.

What is your house like now?

Before any upgrade, this type of house is usually built like this:

- The outer cladding can vary and can be render, brick, blockwork, timber or stone.
- A timber frame structure on the inside of the wall.
- 100mm insulation in the outside wall, between the studs of the timber frame structure.
- They were usually built with no loft insulation and no insulation in the floor
- They often still have the original double glazed windows
- And use Calor Gas type heating

This is typical of this type of house built in the 1980s and 1990s.

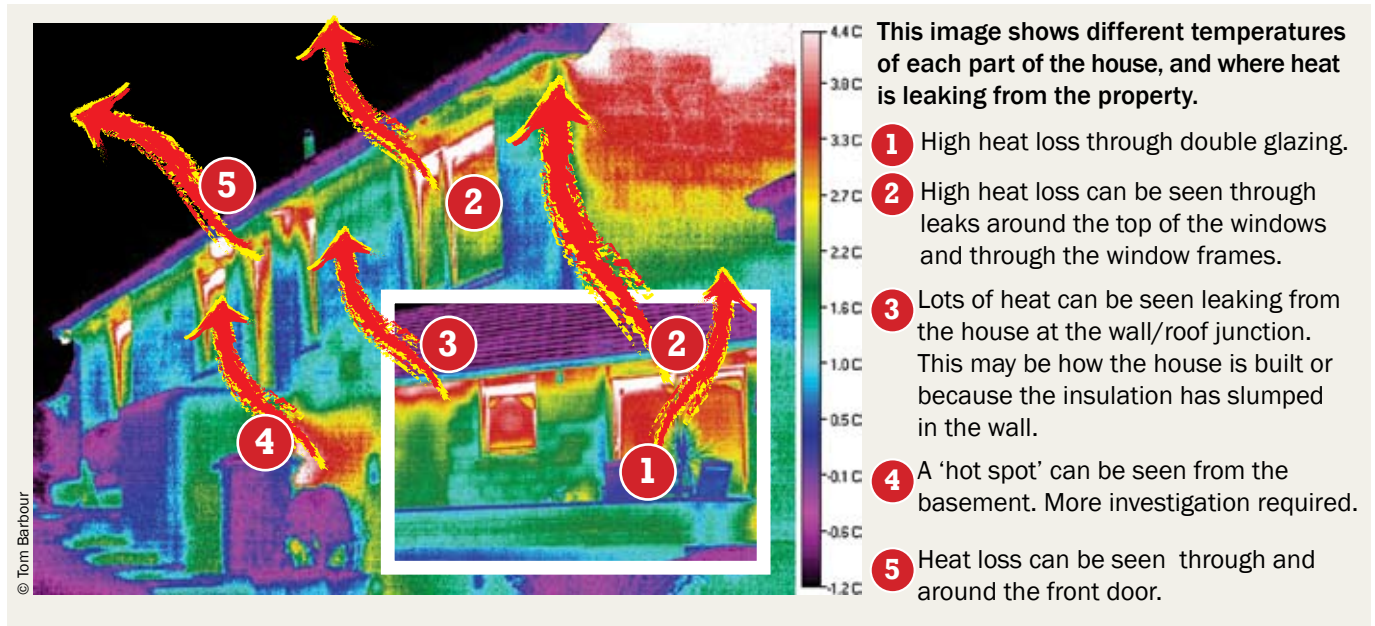
The common problems with this house type are:

- They can be difficult to heat.
- Windows can be draughty.
- They can have problems with damp or mould growth on or in walls.



A typical house of this size and type, before upgrade, would use about £719 of electricity and oil and emit about 4.3 tonnes of CO₂ per year. This is enough to form a layer of CO₂ 30cm deep over the whole pitch at Murrayfield stadium.

WHERE HEAT IS LOST: TIMBER FRAME HOUSE



Hints and tips

Draught proofing

Draught proofing your home is the single most effective measure you can carry out. Old properties are full of character, but are often draughty and can be cold. Ventilation is important in rooms such as the bathroom and kitchen, but you can save up to 15% on your heating bill by cost effective and easy to install measures stopping unwanted drafts.

Cheap insulation

Many insulation types are heavily subsidised. DIY stores sell subsidised insulation and this can be easy to install yourself.

New boiler?

If your boiler is more than 5 years old, upgrading it can improve it's efficiency dramatically, using less fuel overall. And if you are upgrading your boiler, why not consider changing to a different fuel?

Saving water

Did you know that producing drinking water is one of the biggest electricity users in Scotland? Even though water there is plenty of untreated water in Kintyre, processing it is energy intensive and you can save energy and carbon by saving water.



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Free and easy to do UPGRADES PART 1

Compared to cities and suburbs, people in our area are more likely to adapt their homes and lives to changing circumstances than to move to a different house. There are many easy things that can save energy without costing you any money or making changes to the fabric of your house.

1. UNDERSTAND WHERE THE ENERGY GOES

You can use a smart monitor to see how electricity is used in your home. You can often get these for free from your energy company. Typically an awareness of your electricity use can in itself help you to reduce your electricity bill by over 10%.

2. SETTING YOUR HEATING CONTROLS

Set your thermostat to the lowest comfortable temperature – usually between 18 and 21 °C – and you could save up to £65 per year.

3. AVOID STANDBY MODE

Leaving televisions, computers and other equipment on standby can account for nearly 10% of your annual electricity bill. To save this energy and cost, either turn it off, or alternatively you can get ‘powerdown’ switches at low cost which automatically save energy when the device is not in use.

4. DRAWING CURTAINS

Drawing curtains at dusk keeps the heat in when it is cold outside. Opening them in the morning lets the heat from the sun in. Thick, thermal curtains are best at this and thermal linings can be added to existing curtains.

5. LIGHTING

Turn off the lights when you are not in the room to keep electricity use down.

6. HEAT WHAT YOU NEED

Your kettle is a power hungry appliance – just heating the water you need and not overfilling the kettle can make a difference to your bills.



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BEHAVIOURAL MEASURES

Measure	Disruption factor to install	CO ₂ saving/tonnes per year	Saving in bills (£)/per year	Cost to install
Smart monitor	Low	0.2	20	0.00
Setting heating controls	Low	0.17	22	0.00
Standby mode	Low	0.11	18	0.00
Thermal curtains/shutters ¹	Low	0.13	22	0.00

1. Thick thermal lined curtain to single glazed window.

Low cost and DIY UPGRADES PART 2

Making changes to your house itself can be daunting, but many of the upgrades are easy to install and cheap. Each upgrade is explained below. The savings shown in the tables overleaf are for that measure alone, so you can compare different upgrades alongside each other. (Bear in mind that cumulative savings - i.e. from multiple measures - will be different from stand-alone savings.)

1. DRAUGHT PROOFING & VENTILATION

Draughts can make your house feel very uncomfortable and cold and is the most effective measure for you to tackle.

However, it is important to ensure you have good ventilation in your house. The key to this is ensuring you have ventilation where you want it – bathrooms, utility rooms and kitchens in particular. Rooms that have damp air are harder and more expensive to heat.

DRAUGHT PROOFING

This includes measures that are straightforward to do as DIY projects, and the parts required are available at most DIY stores.

Draft proofing doors

Fitting draft proofing to letter boxes and draft proofing strips along the bottom of your front and back doors.

Sealing chimneys

If you have open fires, the flues can be very draughty. When they are not in use, you can seal these with chimney balloons, which can be bought

online and fitted by the householder. There are cheap, simple, safe and removable. Newspaper, pillows and other materials should be avoided as they can be forgotten about and pose a fire risk.

Draft proofing windows

There are a number of discreet systems to help seal the gaps in windows, and around doors. Some of these can be installed as DIY, or there are more permanent solutions that are usually installed by specialists. The latter are very durable although are more expensive.



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If you carry out these low cost and DIY upgrades, you can improve the comfort in your house and save 15-20% from your overall energy bills and your carbon emissions.

1 DRAUGHT PROOFING AND VENTILATION/CONTINUED**VENTILATION**

Our energy audits and advice service identified a common problem in this area - many of our houses suffer from mould growth on walls. This is unsightly and can cause health problems. It is caused by damp in the air, from cooking, bathing and clothes washing, causing condensation on cold walls.

VENTILATION

Good ventilation is important to help avoid this. Having warm, well-insulated walls also reduces damp and mould.

Ventilation fans

There should be ventilation fans in bathrooms, utility rooms and in the kitchen. These reduce in effectiveness with age, and it is important that these are checked regularly to make sure they work well, and are replaced when required. They are found in walls, roofs and

occasionally also windows. They must vent to the outside not to other rooms or attic spaces.

Opening Windows

Opening windows is also important, to get rid of damp air. As is making sure the trickle vents on windows are open is important to allow ventilation.

Drying clothes

Drying clothes outside, or in well ventilated covered areas also helps reduce condensation and mould growth inside the house.



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2. INSULATING ROOFS

This is often one of the easiest and most cost effective improvements you can make to your home. It is likely to be eligible for subsidy or grant funding whether you have no insulation to start with, or are topping up existing insulation to 270mm.



It is important to have the right materials and good workmanship to save the most heat and to avoid condensation problems.

3. RADIATOR PANELS

These are mounted on the wall behind your radiator, and they reflect the heat back into the room. They are cheap and easy to install yourself.

4. INSULATING YOUR WATER TANK

This is a very cheap and easy measure to install and can save you £30-£50 per year. Cylinder jackets can be purchased from DIY stores for low cost.

5. INSULATING YOUR PIPEWORK

Having effective insulation on the pipes that move hot water around your home means that the heat gets to where it needs to be with the minimum of wastage. This is another very cheap and easy way of improving the efficiency of your heating system.

ELECTRICITY

We all use electricity to light our homes and power our household appliances. There are a range of measures we can do to reduce electricity demand and its carbon content.

6. EFFICIENT APPLIANCES

Modern electrical appliances are much more efficient than old ones. Replacing a 12 year old fridge-freezer with a modern A+ rated one will save up to £38 per year and 155 kg CO₂. Look for the EU Energy Rating when buying a new appliance .

7. LOW ENERGY LIGHTBULBS

There is now a wide range of brightness levels and fittings in the new kinds of energy efficient light bulbs. Replacing all the lightbulbs in the house can easily and cheaply save 7% of your energy bills, and 8% of your annual carbon.



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LOW COST/DIY MEASURES

Measure	Disruption factor to install	CO ₂ saving/tonnes per year	Saving in bills (£)/per year	Cost to install (£)
Draught proofing ¹	Low	0.6	107	50-1,000 DIY very cheap, professional more but more durable
Radiator reflector panels	Low	0.022	4	30
Roof insulation ²	Medium	0.4	71	400
Low energy lightbulbs ³	Low	0.3	50	20
Insulating cylinder ⁴	Low	0.22	36	15

1. Based on draught proofing windows, doors, floors and chimneys.
 2. Based on upgrade from no insulation to 270mm glass wool.
 3. From all standard light bulbs to 100% low energy.
 4. Based on standard insulation jacket from DIY store.

Investment and higher cost upgrades

UPGRADES PART 3

Investing in your property is a big step, however can create dramatic improvements to your comfort and running costs.

If you carry out a combination of these investment measures you can cut your energy costs by 48% and your carbon emissions by more than 62%. This is shown in the case study section at the end.

UPGRADING THE FABRIC OF THE HOUSE

This can often be combined with other works such as insulating the wall and floor when you are redecorating a room.

1. INSULATING FLOORS

15% of a home's heat can be lost through its ground floor. Timber frame house ground floors like this one are often fairly easy to insulate as there is often access to the space under the floor. Sometimes they have solid floors that would be insulated by putting a slimline insulation underneath the floor covering. Insulating a timber floor also reduces draughts, which improves comfort more than would be indicated by the energy and cost savings.

35%
OF A HOME'S HEAT
CAN BE LOST
THROUGH ITS
EXTERNAL WALLS

2. UPGRADING WINDOWS & DOORS

Older windows tend to be draughty and new double glazed windows perform much better than old ones. Windows represent an opportunity to improve comfort in your home, as well as reduce your energy use. Changing your window type sometime requires planning permission.

3. INSULATING WALLS

Up to 35% of a home's heat can be lost through its external wall. There are two ways to insulate your walls – either inside, or outside. Insulation applied to the outside of your house is the most effective in this type of house, and is less disruptive to install, however will require planning permission. Insulating internally does not change the appearance of your house and will not require planning permission, but is very disruptive and is best done when you are renovating a room. Slimline insulation can be installed more easily on top of existing wall linings. You can spread the cost over time by doing one room at a time if doing internal insulation.



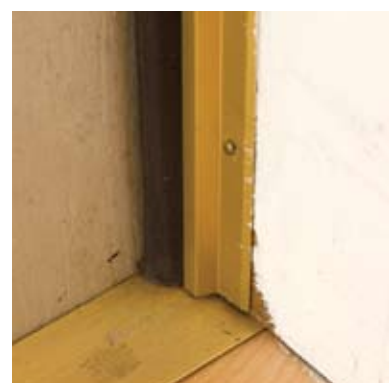
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INVESTMENT AND HIGHER COST UPGRADES/CONTINUED

4. PORCH

A heated and well ventilated porch acts as a draught lobby, reducing cold air getting into the house, and giving a great place to dry wet outdoor clothes. These can be added to your house, but does require planning permission.

HEATING SYSTEM

The efficiency of heating systems has improved a lot over recent years and replacing an old system can significantly reduce the energy used to provide heat and hot water, therefore reduce your bills.

5. INSTALLING CENTRAL HEATING

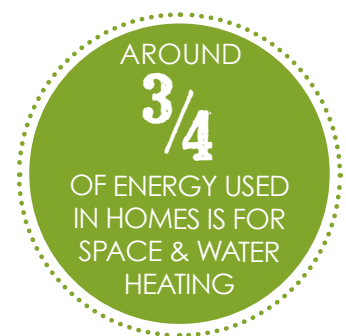
A full central heating system is one of the most cost effective ways of heating both your home and water. In some instances, grants are available to older people to have systems installed. The Energy Saving Trust can advise on this. Call them on **0800 512 012** or visit www.energysavingtrust.org.uk

6. REPLACING YOUR BOILER

Replacing a 15 year old boiler with a new condensing model can reduce your fuel use by up to a third. If your household does not use a lot of hot water, you could consider installing a combi boiler, so you only heat the water you use. If you are considering changing your boiler you might also consider changing the fuel you use. Information about this is in the next section.



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**INVESTMENT - FABRIC UPGRADE**

Measure	Disruption factor to install	CO ₂ saving/tonnes per year	Saving in bills (£)/per year	Cost to install (£)
Walls - internal ¹	High	0.5	72	11,000
Walls - slimline ²	High	0.4	65	12,000
Walls - external ³	Medium	0.4	72	21,000
Floor - under timber ⁴	High	0.3	50	4,400
Floor - slimline ⁵	High	0.3	43	7,300
Doors and windows ⁶	Medium	0.3	36	13,000

1. Based on 150mm insulation to timber frame, plasterboard finish, decorated.

2. Based on 10mm Proctor Spacetherm P with plasterboard finish, decorated.

3. Based on 150mm insulation rendered.

4. Based on 170mm mineral wool insulation between joists, accessed from void beneath floor.

5. Based on 10mm Proctor Spacetherm with chipboard finish.

6. Based on timber composite frame, good quality double glazed windows and insulated door.

HOUSE TYPE

Timber Frame House

Fuel types

The Energy audits show that the majority of people in the Tarbert area use electricity to heat their homes. Only a small proportion of people use wood as their main source of heat, however more use it as a secondary fuel.

The kind of fuel we use for heat has an effect on its cost and the amount of green-house gases it produces. The cost of oil and LPG has increased significantly over the last year, as has electricity. Renewable energy, on the other hand, can be almost entirely cost free to generate and produces very little emissions.

Generating your own electricity has become much cheaper – indeed profitable – with the introduction of the ‘Feed in Tariff’ where you are paid to produce your own electricity. Renewable heat is due to have a similar scheme introduced in spring 2011 through the Renewable Heat Incentive. To find out more, contact the Energy Saving Trust on 0800 512 012 or go to www.fitariffs.co.uk

Our area uses predominantly expensive, high carbon fuels, but has a great opportunity to change to fuels such as wood, which is locally available and less likely to fluctuate in price. As well as logs, wood can be used as pellet fuel, which is made in Scotland and can be part of an automatic or semi automatic system.

Changing fuel won't mean you reduce the amount of energy you need to heat your home, but it can reduce your emissions by up to 93%, dependant on your fuel choices.

Calor gas and oil.

Many houses use one of these fuels as their primary fuel, but are keen to have a back up system in place, or to use it in conjunction with the likes of a wood stove to reduce costs, reduce reliance on fuel supplies and to reduce emissions.

Costs of these are rising dramatically, so reducing use through energy efficiency or fuel change is important to householders in our area.

Coal

Coal has the highest emissions of all the kinds of fuels we use. In most situations, coal can be replaced by wood, which is cleaner and has much lower emissions. Open fires are really inefficient and can lose 85% of the heat up the chimney. Changing to wood burning stoves or central heating makes a big difference.



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CHANGING
FUEL COULD
REDUCE YOUR CO₂
EMISSIONS BY

93%

FUEL TYPES/CONTINUED

Wood burning stoves and wood availability

Many of us have wood burning stoves, and others are interested in fitting them. Wood stoves are an efficient way of providing heat and, if fitted with a back boiler, can also heat water. Planning consent is not usually required if you are using an existing chimney, but will be if you need to create a new one.

Pellet boiler

If you are changing boilers it would be worth considering a wood pellet type. Pellets have very low emissions and can be supplied to our area. The boilers can be manually or automatically fed. They are very efficient and don't produce much ash and are particularly good as a replacement for oil boilers.

Photovoltaic (PV) Panels

PV panels are rapidly improving in cost effectiveness and efficiency. They need to face roughly south and can be mounted on a roof, wall or on the ground. The

electricity they produce can be eligible for the 'Feed In Tariff', which will significantly increase the savings to that shown below. Within the conservation area, planning permission will be required.

Solar thermal panels

Solar thermal panels generate hot water and are usually mounted on south facing roofs. In the conservation area, you will need planning permission for these.

Air Source Heat Pumps

These make use of the warmth in the outside air to help reduce the energy needed to heat your home. They are only suitable if the house is well

draught proofed and insulation is also installed, to make them efficient enough to be worthwhile.

The savings here are for displacing electric heating - you won't save any CO₂ replacing gas with a heat pump. These may be eligible for the Renewable Heat Incentive which is due to start in spring 2011.

Please note that you should check with your planning authority whether planning permission is required in your area. Some technologies don't require this in some areas, but do in others, for example if you are in a conservation area or your house is listed you will require permission.

HEATING SYSTEM

Measure	Disruption factor to install	CO ₂ saving/tonnes per year	Saving in bills (£)/per year	Cost to install (£)
Upgrade boiler ¹	Medium	1.3	216	2,000
Photo voltaic panels ²	Medium	1.4	1200	8,000
Solar thermal ³	Medium	0.6	79	6,000
Biomass ⁴	Medium	3.2	216	7,000

1. To modern condensing oil boiler.
2. 2.2kW PV panels.
3. 4m² solar panel.
4. Semi automatic pellet boiler.



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HOUSE TYPE

Timber Frame House

Overall upgrade - case study



Doing a package of work to your house, from all three levels of the upgrades – free, low cost and investment – could reduce your energy bills by 48% and create an income of up to £1,000 per year for generating your own renewable energy as well as reducing your carbon emissions by 62%.



You **can** create a warm, comfortable house that generates income annually like this:

Free and easy upgrades

To reduce your bills.

- Understand and reduce your electricity use.

Low cost and DIY

To reduce the draughts and reduce the damp air and condensation.

- Draught proof your doors, windows, chimneys and floor and ensure you have good ventilation.
- Install loft insulation.

THIS WOULD COST YOU UP TO **£1,200** TO DO THE LOW COST AND DIY MEASURES.

Investment upgrades

These are upgrades to the house itself to make it warm, easier to heat and to further reduce draught.

- Install internal slimline insulation.
- Upgrade your windows to modern standard double glazing.
- Insulate under the ground floor.

TO DO THE LOW COST AND FABRIC UPGRADES THIS WOULD COST ABOUT **£24,000**.

This house has a fairly new and efficient oil fired combi boiler and a wood stove which uses locally sourced timber as a fuel. These would be kept.

Adding renewable electricity generation on the roof will reduce your carbon footprint and allow you to make money from your property by generating renewable energy.

- Retain the existing up to date boiler and wood stove.
- Install a 2.2kWpeak PV panel system

DOING ALL THE WORK TO THIS HOUSE WOULD COST ABOUT **£30,000** IN TOTAL, EXCLUDING VAT.

If you were upgrading your boiler changing to a wood pellet boiler would mean your carbon emissions would drop further and you could benefit from the renewable heat incentive.

This table compares energy cost and carbon before and after upgrade, and compares this to a modern eco home built locally.*

UPGRADE COMPARISONS

	Cost of energy per year/£	Total CO ₂ emissions per year	Cost of energy per year (£) per m ² floor area	CO ₂ emissions per year per m ² floor area
Before upgrade	719	4.3 tonnes or 4,300kg	9.30	0.05 tonnes or 50kg/m ²
After upgrade	273	2.2 tonnes or 2,200kg	3.50	0.03 tonnes or 30kg/m ²
Local modern Eco house	908	4.6 tonnes or 4600kg	4.50	0.02 tonnes or 20kg/m ²

* Remember that the eco home is a larger property – it's best to compare the cost and emissions values per m².

For more information about the eco home please refer to Case Study 6 - Modern Eco Home.

What can you do next?

Want to find out about grants?

Further information about this can be found via the Energy Saving Trust: www.energysavingtrust.org.uk

Who supplies the items I need to do these upgrades?

The BGT blog has an up to date list of local suppliers. Please look here for information.

BGT blog: <http://greentarbert.wordpress.com>

How can I use this information?

Because heating patterns and bills vary so much, the best way to check the energy saving percentage against your own bills to get an idea of savings.

This is a simplified system and should be taken as a broad brush indication. However it is here to give you a clear indication of the difference between the options, allowing you to make informed decisions.

Also, some people can carry out many of the measures as DIY, whilst others will ask tradesmen to do the work.

When considering individual measures, one thing to be aware of is that if you carry out several upgrades, the savings cannot be added together directly. Of course, doing more upgrades will save more money and carbon, but the amount you save per additional measure is less. All costs are approximate and are based on the case study house.

Further information

For updates to this manual please visit the Big Green Tarbert blog: <http://greentarbert.wordpress.com>

Energy Saving Trust: <http://www.energysavingtrust.org.uk>

The Eco-House Manual: how to carry out environmentally friendly improvements to your home.

Nigel Griffiths. ISBN 9781 84425 4057

Energy Heritage: A guide to improving energy efficiency in traditional and historic homes. Changeworks. 2008.

Can be downloaded for free at: <http://www.changeworks.org.uk/projects/energy-heritage/544/>

Renewable Heritage: A guide to microgeneration in traditional and historic homes. Changeworks. 2009.

Can be downloaded for free at: http://www.changeworks.org.uk/uploads/Renewable_Heritage_Programme.pdf

Energy Modelling Assumptions

All projections are based on SAP 2005 modelling of changes. Overall the figures should be accurate as a broad indication, but any individual house will vary. You can compare your own bills and potential savings pro rata. There were high discrepancies found between modelled and actual fuel bill data – for example one of the properties was shown as having fuel bills of £690 annually and emitting 8 tonnes of CO₂e when modelled in SAP, but fuel bill data indicated an annual energy spend of £2240 and CO₂e emissions of 12.6 tonnes.

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BIG GREEN TARBERT 

