



Energy Conservation

Information Service, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ.
Tel: 01654 705989; email: info@cat.org.uk

<http://info.cat.org.uk/energy-conservation>

Why save energy?

The energy we use in our homes makes up about one quarter of the UK's carbon dioxide (CO₂) emissions. A lot of this energy is wasted, and a few simple measures will help you to avoid many tonnes of CO₂ emissions, reduce your bills, and make your home more comfortable and healthy by reducing draughts, damp and condensation.

This sheet gives an overview of options – for more details please see our website and the publications mentioned.

All bought or rented houses must have an Energy Performance Certificate (EPC), assessing levels of insulation, heating controls, lighting, and so on. This is a good starting point for identifying improvements and the likely costs. In most cases the first step is to improve insulation levels.

Loft and Roof Insulation

In most cases, loft insulation is a DIY job. About 270mm of standard insulation will meet current standards, but the ideal thickness is more like 350mm - so where it's easy, put in more. If your loft has been converted into a room you'll need to insulate in the sloping roof. The best way of achieving a good level of insulation in the roof slope is to use two layers of timber: the first to support the roof finish, the second to support the insulation and ceiling finish. Insulation between the timbers provides a thermal break. A 50mm air space is usually needed between insulation and tiling felt.

Wall insulation

If you have cavity walls you can easily get insulation blown in. This takes less than a day to do and causes minimum disruption.

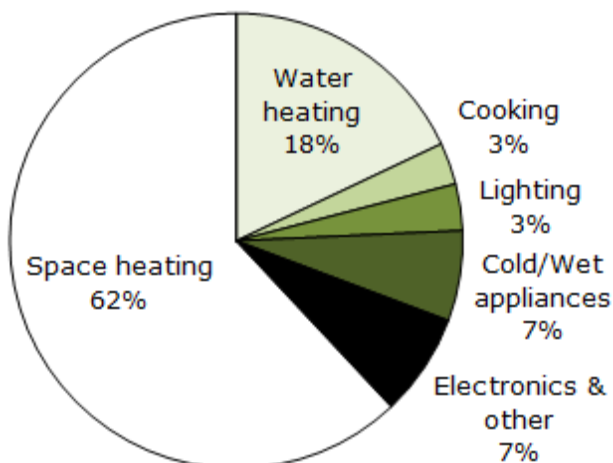
It is much more expensive and disruptive to insulate solid walls, but can be worthwhile in the long term. With internal insulation you do lose a little of the room space and will have to move sockets, radiators and so on.

External insulation is less disruptive, and it means you keep the 'thermal mass' of wall inside, which then acts as a form of heat storage, absorbing heat and slowly releasing it to give a comfortable living environment.

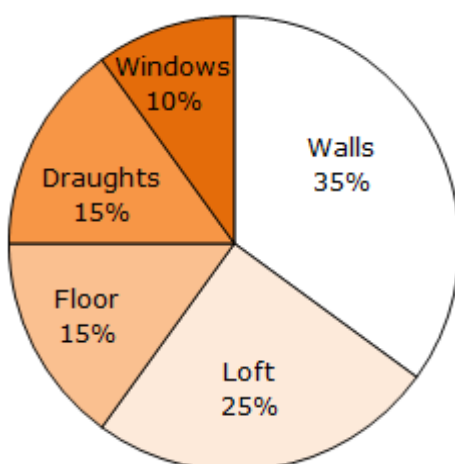
Floor insulation

For a suspended ground floor, add insulation batts between the floor joists – either through access to the underfloor space or by lifting the floorboards. Aim to reach about 200mm of insulation. Less insulation is needed for a solid floor, but more work is involved: lifting tiles and digging out a little, or raising the floor level.

Average energy use in the home



Heat Loss from an average home



Draught-proofing

This is another very simple DIY job. Some ventilation is essential (such as providing air to rooms with fuel burning appliances and to ventilate timbers in the roof & floor) but it is important to minimise unwanted ventilation. Even very small draughts can make a room uncomfortable during cold weather.

Draughts occur down chimneys, around window & door frames, through letterboxes and cat flaps, at skirting boards, between floorboards, and where services enter.

Carrying around a smoking stick, such as incense, is a simple way to find unwanted ventilation - the smoke will be blown away from the source of any draughts.

Use sealant paste to fill gaps at skirting boards, between floorboards and around service ducts. Either board up an unused chimney or use a 'chimney balloon' - so that if a fire is lit the balloon will burst. Use wiper and compression seals on openings such as windows, doors, cat flaps and letterboxes. Finally, thick, well-fitting curtains will greatly reduce night-time heat loss from windows - and make sure curtains finish on a shelf above a radiator (not hanging in front).

Central heating

Fit controls such as thermostatic radiator valves and room thermostats to make it possible to heat different rooms only as much as you need, rather than heating the whole house to the same temperature. If your boiler is very old, then upgrading to a modern, high-efficiency condensing boiler could cut a third off your fuel bill.

Hot water

Wrap all hot water pipes in insulating foam sleeves and if you have a hot water cylinder ensure it has an extra jacket. If you need to upgrade your cylinder, then consider solar water heating, as a special 'twin coil' cylinder will be required. For more details see our '*Solar Water Heating*' sheet.

Glazing

If replacing windows, the most efficient units use low emissivity (low-E) glass and are argon-filled. Low-E glass reflects heat back into the house, while argon is an inert gas that conducts heat less well than air. If your existing windows are in good repair, they can be improved with secondary glazing - anything from a clear plastic film to a second window fitted inside the original.

ELECTRICITY USE

As shown in the graphs above, electricity use for appliances and lighting is small when compared to heating demand. However, grid electricity is currently a high-carbon fuel as most power stations are not very efficient (about two-thirds of the energy in the fuel is lost as waste heat). Per unit of energy, the carbon dioxide (CO₂) emissions from electricity use are about 2.5 times as much as from mains gas (based on how we generate electricity at present).

Ideally, switch to a supplier that uses only renewable sources like solar, wind and hydro power, as this helps to promote these technologies and reduce CO₂ emissions. However, it is still vital to reduce electricity use so that the UK as a whole can move to 100% renewable electricity more quickly.

Lighting

The first step is to switch off lights when unused. It's not true that low-energy light bulbs take much more energy to warm up than they use over time - If a room will be empty for over 15 minutes, turning the lights off will save energy.

The other key step is to use low-energy bulbs. Only 10% of the electricity used by incandescent bulbs is converted into light - the rest is given off as heat. For much of the year this heat is not needed, and in the winter it's an expensive way to get warm!

Compact fluorescent lamps (CFLs) are far more efficient; they use 75% to 80% less energy than incandescent bulbs, so a 20W CFL replaces a 100W (watt) incandescent.

This saving means that CFLs repay purchase cost within a year. They also last longer, so you need fewer replacements. Many types of CFL are now available, including dimmable ones and spotlight/down-lighter fittings.

LED (light-emitting diode) bulbs are a newer option. Be wary of 1 or 2 watt LED bulbs, as these are too dim for domestic spotlights, but there are now LEDs of 10W or so that can replace 30W halogen bulbs. At present, CFLs are more widely available, but as LEDs develop they could offer greater efficiency and longer lifetimes.

Another factor is the design and placement of fittings. Use good 'task lighting' in key areas (e.g. worktops, reading lamps) so you don't need strong lights in the whole room.

Cold Appliances

Fridges & freezers can make up a big chunk of electricity use as they're always plugged in. Modern ones are much more efficient, so consider upgrading if your cold appliances are very old. Upgrading to a new model can quickly recoup costs. When buying a fridge or freezer, look carefully at the rating on the Energy Label, as an A++ rated fridge uses 50% less electricity than an A rated one. Buy an appliance that is no bigger than you need; a half-empty fridge works harder to cool down after the door has been opened.

Put them in a cool room if you can - or at least away from a cooker, other heat source, or direct sunlight. Allow space around the back grill for good air circulation. To maximise efficiency keep the back grill clean from dust, replace damaged door seals and defrost regularly. Lowering the thermostat by 1 degree increases energy consumption by 3%, so keep a fridge only as cool as you need.

Wet Appliances

Most energy use in a washing machine is for heating water, so use a low temperature setting whenever you can and always wash a full load. Tumble-dryers use lots of energy so use a washing line to dry clothes as often as possible. A high-speed spin cycle is an efficient way to remove water; a 500rpm spin removes about one-third of the water, but a 1100rpm spin removes half.

Again, if buying a new machine look for the highest Energy Label rating. Gas-powered dryers have lower emissions than electric ones, whilst new 'heat pump' based models are also much more efficient.

Consumer Electronics & Computers

With the rise of wide-screen TVs, computers and home entertainment systems, electricity use in this area is growing fast. Most are not covered by Energy Labels, so it's harder to find out what electricity consumption will be - it can vary a lot between similar products.

A key step is to avoid leaving appliances on standby. The average home spends tens of pounds each year just powering devices on standby. Across all homes this is a huge amount, equal to at least one power station.

Watch out for 'phantom loads' - many appliances have internal transformers that draw power when the device is off but the supply at the wall socket is still on.

Cooking

A gas cooker usually results in lower carbon emissions than an electric cooker, because burning gas directly is more efficient than generating electricity in gas-fired power stations. Gas cookers are also cheaper to run and the hobs more controllable.

Overall, a gas hob leads to about half the CO₂ emissions of most electric hobs, but modern electric induction hobs come close.

On the hob, use well-fitting saucepan lids and make sure that the saucepan covers the electric ring or gas flame. Adding a little salt lowers the boiling point of water and prevents vitamins leaching from vegetables as they cook. Steaming vegetables uses less energy and water than boiling and retains more vitamins. Try to plan oven cooking so you don't roast empty shelves. Grilling food is usually more efficient than oven baking.

Microwaves are far more efficient than a standard oven, as they heat only the food and not the surroundings. However, avoid eating lots of frozen, microwaveable ready meals, as all the food processing & storage involved will result in high carbon emissions.

Heat only the water you need a kettle. Regularly boiling unused water adds up to a massive energy waste across all UK homes.

Some Potential Costs & Savings

Measure	Cost (£)	Payback
Low-energy light	5	9 months
Insulate cylinder	15	6 months
Insulate hot pipes	20	2 years
Loft insulation	300 - 400	2 years
Draught-proofing	100 - 300	3-6 years
Cavity wall insulation	350 - 700	3-4 years
Heating controls	125 - 250	2-5 years
Floor insulation (DIY)	250	3-4 years

See also the EST website for further tips:

Energy Saving Trust (EST)

www.est.org.uk or 0300 123 1234

More advice about energy saving measures and what financial support may be available.

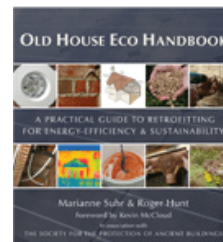
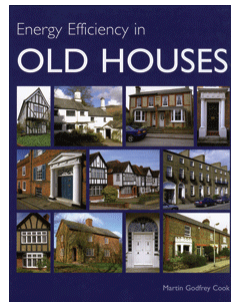
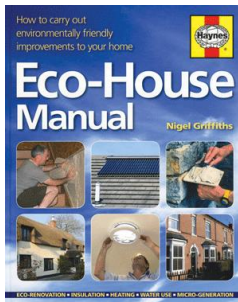


Centre for Alternative Technology Canolfan y Dechnoleg Amgen

CAT Mail Order

<http://store.cat.org.uk/> ☎ 01654 705959

See our online shop for many books that look at refurbishing houses to reduce energy use.



CAT Short Courses 2017

<http://courses.cat.org.uk/> ☎ 01654 704966

3 – 6 June **Eco Refurbishment (5 days)**

and Covers ecological improvements to existing buildings, including energy efficiency, renewable energy, water re-use and conservation, healthy buildings and hazardous building materials. It includes a number of practical demonstration sessions.

3 – 6 Nov

CAT University Degrees

<http://gse.cat.org.uk/> ☎ 01654 705953

Interested in sustainability? Then why not make it your career! CAT offers fully accredited, hands-on Masters courses in Renewable Energy and Sustainable Architecture & Design.

CAT Charity

<http://support.cat.org.uk/> ☎ 01654 704950

We rely on generous donations to continue to provide this information service free at point of use. You can support us and the other work CAT does by donating, or joining CAT Membership.

Copyright © 2017 Centre for Alternative Technology

<http://info.cat.org.uk/energy-conservation>