ARMSTRONG

White paper

Saving energy at home

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1.0. INTRODUCTION

Increasingly, energy costs are taking up more and more of the household budget, so it's really important that we are able to buy and use energy wisely without compromising comfort levels.

The best way to do this is to follow a systematic plan:

1. Make sure that you are getting the best deal from your energy provider
2. Reduce your demand as much as possible without reducing your comfort
3. Install affordable low energy equipment
4. Install renewable energy equipment (but only after carrying out 1 to 3 and then only if affordable)

The following sections of this guide will explain in more detail how to get the best deal from your energy supplier and describe some of the other options you have that will make a real difference to your energy costs.

Most of the ideas put forward in **SECTIONS 2, 3** and **4** should, at best, cost nothing at all or, at worst, a modest investment.

The ideas put forward in **SECTIONS 5** and **6** will require a little more investment but **SECTION 7** will give guidance on financial help available.

SECTION 8 contains sources of further information and in **SECTION 9** you can find an action plan which summarizes the main points of the document. You can use this to tick each action after completion.

All of these tips are relatively easy to employ and cost very little. Yes, individually they may only seem to give us a very small benefit but added together they add real value. The Great Britain cycling team proved in the 2012 Olympics that the sum of many small improvements results in a significant performance leap. They call this concept "performance by the aggregation of marginal gains" and it holds true for many things in life such as reducing energy costs, losing weight or improving business performance.

YOU CANNOT IMPROVE ONE THING BY 1000%, BUT YOU CAN IMPROVE 1000 LITTLE THINGS BY 1%

JAN CANZON, FORMER CEO OF SCANDINAVIAN AIRLINES

2.0 GETTING THE BEST DEAL FROM YOUR ENERGY PROVIDER

2.1 UNDERSTANDING YOUR ENERGY BILLS

Energy suppliers seem to make their bills as confusing as possible. Although the Government has said that it wants them to address this issue, it's still a good idea to learn how to interpret the information in the bills and then compare prices from different suppliers. What on the surface may appear to be the cheapest deal might not actually turn out that way.

Your energy bill will contain lots of information like your name, address, account number, name of your gas or electricity tariff plan, meter number, billing period, meter readings and the amount charged. If you pay a standing charge, a single rate will be shown on the bill. If not then you will pay a higher price for a given number of units and a lower price thereafter.

Finally, your bill should tell you if it's based upon a meter reading taken by you (usually indicated by the letter **C** for customer) or by your energy supplier (**A** for actual) or if it's an estimated reading (**E**).

All of this information is important but when you've checked the obvious stuff like name, address, account number etc once, then the really important thing to check is the amount and cost of the energy charged for. To do this we need to be able to read our meters.

Electricity meters measure energy use in kWh. The most common types of electricity meter are single-rate digital meters, variable-rate digital meters or dial meters.

Single-rate digital electricity meters have one set of numbers to refer to.

1. Write down all the numbers from left to right.
2. Ignore any numbers after the decimal point (usually shown in red).

Economy 7 variable-rate digital electricity meters have two displays or the ability to switch between two displays.

1. Write down the numbers from both displays, ignoring any figures in red. Economy 10 meters have an additional display to record three different time periods.

Dial electricity meters have a series of clocks with numbers from zero to nine. Each dial turns in the opposite direction to the dial before it.

1. Start with the dial on the left and write down the number indicated by the pointer on each dial, moving progressively towards the right.
2. If the pointer is between two numbers, record the lower of the two. If the pointer is between nine and zero, record as nine.
3. Ignore any red dials.

So, to work out how many units of electricity you've used in any given period, simply subtract your previous reading from the current reading.

Unfortunately, gas meters do not measure energy use in kWh. Instead, they either show energy use in cubic metres (m^3) or, if it's an older type meter, in cubic feet (ft^3). The most common type of gas meters are digital (reading m^3 or ft^3) or dial meters and the reading procedure is exactly the same as with the electricity meters above.

Digital gas meters have one set of numbers to refer to; these units are either m^3 or 100s of ft^3.

1. Write down all the numbers from left to right.
2. Ignore any numbers shown in red

Dial gas meters have a series of clocks with numbers from zero to nine. Because these are older meters, they will invariably display 100s of ft^3.

1. Start with the dial on the left and write down the number indicated by the pointer on each dial, moving progressively towards the right.
2. If the pointer is between two numbers, record the lower of the two. If the pointer is between nine and zero, record as nine.
3. Ignore any red dials.

So, to work out how many units of gas you've used in any given period, simply subtract your previous reading from the current reading.

However, we must remember that these units are either cubic metres (m^3) or hundreds of cubic feet (ft^3). To convert these units into the kWh shown on our bills we need to follow the steps below:

1. Subtract your previous reading from the current reading.
2. If your meter reads hundreds of ft^3 multiply by 2.83 to convert to m^3 (obviously ignore this step if your meter reads m^3).
3. Multiply by 1.02264 (an adjustment factor for pressure and temperature).
4. Multiply by the 'calorific value' shown on the gas bill (usually 39.2)
5. Divide by 3.6 to arrive at your kWh figure.
6. Multiply the kWh figure by the gas cost in pence per kWh shown on the gas bill.

Imperial example:

Your previous meter reading was 7833 (100s) ft^3 and the current reading is 7965.

1. 7965 − 7833 = 132
2. 132 × 2.83 = 373.56
3. 373.56 × 1.02264 = 382 m^3
4. 382 × 39.2 = 14974
5. 14974 / 3.6 = 4156 kWh
6. 4156 × 0.04 = £166.24

Please note that the figure of 2.83 is to convert 100 ft^3 to 1 m^3. 1 ft^3 is equal to 0.0283 m^3.

Metric example:

Your previous meeting reading was 02649 m^3 and the current reading is 02972.

1. 2972 – 2649 = 323
2. This step is not required
3. 323 × 1.02264 = 330 m^3
4. 330 × 39.2 = 12936
5. 12936 / 3.6 = 3593 kWh
6. 3593 × 0.04 = £143.72

Obviously for electricity the whole process is much simpler because the metered units are already in kWh. So for a previous meter reading of 17534 kWh and a current reading of 18219, the cost would be:

1. 18219 – 17534 = 685 kWh
2. 685 × 0.14 = £95.90

If you pay your energy bills by direct debit, your supplier estimates how much energy you'll use in a year and then divides this into equal monthly payments. So you will effectively underpay in the winter and overpay in the summer but these should balance out.

However, it is recommended that you take the readings yourself each month and update them on the website of your supplier, so that the amount of your monthly debit can be adjusted according to your consumption before your debt gets too high.

2.2 GETTING THE BEST DEAL

It can seem a daunting task to compare prices from different energy suppliers because of the different tariffs they employ; some have standing charges some don't, some have two tariffs some don't. The best way to compare prices is to create a 'level playing field'. To do this, follow this simple plan:

1. Get your last four bills and add up the total kWh and the total cost in £ including all standing charges.
2. Divide the total cost by the total kWh to give the true cost per kWh.

So for example:

Q1 bill	1722 kWh	£241
Q2 bill	1067 kWh	£149
Q3 bill	867 kWh	£121
Q4 bill	1655 kWh	£232
Total	5311 kWh	£743

$\frac{743}{5311}$ = £0.14 per kWh

Armed with the true cost per kWh you can then make real comparisons with offers from other suppliers.

It's usually beneficial to put your gas and electricity supplies in the hands of one company in what's known as a dual fuel deal. Paying by direct debit also invariably results in better prices.

A good way to compare prices is to enter your details (annual energy use, post code, type of tariff, energy supplier etc) into one of the cost comparison sites. There are a number around such as:

www.which.co.uk/switch

www.moneysupermarket.com/gasandelectricity

www.moneyexpert.com/energy

I switched last year using WHICH? SWITCH and saved over £200. The move was very easy to do, didn't cause any hassle or disruption and cost absolutely nothing.

Once you decide which provider you want to go for, all you have to do is complete an online application form filling in your details, which you can easily find on your last bill.

Your application is then sent to the new provider within 24 hours to start the switching process. If you should change your mind after requesting the switch, you'll have a 'cooling off' period, usually around 12 to 14 days, in which to stop it going through.

If you don't cancel the switch, you'll receive the new contract and terms and conditions within 10 days of the application.

Once the cooling off period has ended, the new provider will contact your old provider to start the switching process, which takes between four and eight weeks.

If you pay by Direct Debit, you'll need to leave this alone for time being. Your final meter reading will be taken and a final bill issued based on that reading. If your account is in debit, your old provider will ask for payment in full. If your account is in credit you'll get the money paid back to you.

Your new supplier will contact you to confirm the start date of the new supply and details of when the first payment will be required.

3.0 REDUCING YOUR ENERGY DEMAND AT HOME

Once you've got yourself the best possible deal, look at ways you can reduce your demand and further cut your energy costs.

3.1 INSULATION

This is by far the most cost effective measure you can take. Insulating your loft and cavity walls can save you over £300 per year.

Loft insulation

Currently the recommended thickness for loft insulation is 270 mm. If you already have some loft insulation but it falls

short of the recommended thickness you can still reduce your energy bills further by topping it up.

For a typical three-bedroom, semi-detached house costs would start at around £50 for a DIY installation. Professional insulation costs vary so it's well worth shopping around on the internet to see what's available. A typical house could save around £175 a year by installing loft insulation.

Cavity walls insulation

Most houses installed since 1932 should have cavity walls (an air gap between the inner and outer external brick walls to prevent rain water from penetrating between the two layers). Those built in the last 10 years or so should already have the cavities insulated.

Typical cavity wall construction

The installation is relatively simple. Insulation material is blown through the outer wall to totally fill the cavity and dramatically reduce heat loss. However, this is not a DIY project and must be carried out professionally.

Typical solid wall construction

Houses with cavity walls usually have external walls with a thickness greater than 280 mm (11") and have bricks which are of the same length and facing in the same direction.

Costs for a typical three-bedroom, semi-detached house would start at approximately £250 and save close to £135 a year.

Under certain circumstances you can have loft and cavity wall insulation installed for free. As these offers frequently change, it's best to check the websites of the leading energy suppliers and your local authority.

Solid wall insulation

If your home was built before 1920, the external walls are probably solid rather than cavity walls. Solid walls have no gap between them, so they let through twice as much heat as cavity walls.

Solid walls can be insulated — either from the inside or the outside. This will cost more than insulating a standard cavity wall, but the savings on your heating bills will be bigger too. For example, a typical semi-detached house with three bedrooms with internal insulation could save approximately £460 per year and one with external insulation could save approximately £490 per year.

Internal wall insulation is done by fitting rigid insulation boards to the wall, or by building a stud wall filled in with mineral wool fibre. Total cost: £5,500 to £8,500.

External wall insulation involves fixing a layer of insulation material to the wall, then covering it with a special type of render (plaster work) or cladding. The finish can be smooth, textured, painted, tiled, panelled, pebble-dashed, or finished with brick slips. Total cost: £9,400 to £13,000.

3.2 DRAUGHT-PROOFING

Draughts are a bit like ventilation — both let fresh air into your home. Good ventilation helps reduce condensation and dampness. But draughts are uncontrolled, they let in too much cold air and waste too much heat. To draught-proof your home you should block unwanted gaps that let cold air in and warm air out. Saving warm air means you'll use less energy to heat your home.

Draughts happen where there are unwanted gaps in the construction of your home, and where openings are left uncovered. You should block most of these — but be careful in areas that need good ventilation:

- Areas where there are open fires or open flues.
- Rooms where a lot of moisture is produced, such as the kitchens, bathrooms and utility rooms.

DIY draught-proofing typically costs around £100 for materials. Professional draught-proofing might cost double this, but it is likely to save more energy because the installer will know exactly the right materials to use and where to use them.

The Green Deal (see **SECTION 7**) was launched on 28 January 2013. All of the measures mentioned above (along with many other) qualify for the Green Deal and could allow you to install these without any upfront costs. Payment is recovered by a small increase in your electricity bills which is more than offset by the savings made.

3.3 WINDOWS

All properties lose heat through their windows. But energy-efficient glazing keeps your home warmer and quieter as well as reducing your energy bills. That might mean double or triple glazing, secondary glazing, or just heavier curtains.

Replacing all single-glazed windows with B-rated double glazing could save you close to £170 per year on your energy bills. As well as keeping the heat in, energy efficient-windows insulate your home against outside noise.

The costs and savings for energy-efficient glazing will be different for each home and each window, depending on the size, material and installer. Double glazing should last for at least 20 years.

To get a better idea of how much you could save by replacing your windows, use the Energy Saving Calculator at the Glass and Glazing Federation's website, developed with the Energy Saving Trust. (www.ggf.org.uk/energy-savings-calculator)

Secondary glazing

A secondary pane of glass and frame can be fitted inside the existing window reveal. This won't be as well sealed as a double-glazing unit, but will be much cheaper to fit, and will still save energy — you could save close to £105 a year on fuel bills. Low emissivity glass will improve the performance of secondary glazing.

Secondary glazing kits are available for the proficient DIYer to install themselves — these cut down on costs and are a non-intrusive way of insulating your windows.

Heavy curtains, sealed blinds and shutters

Curtains lined with a layer of heavy material can reduce heat loss from a room through the window at night and cut draughts. Hollow blinds, fitted into place with a sealed frame, and sealed shutters will also help cut draughts and keep your heat in for longer.

4.0 REDUCING DRIVING ENERGY CONSUMPTION

4.1 PETROL STATIONS

Find the cheapest petrol station in your area:
The www.petrolprices.com website enables you to find the cheapest petrol station in your area and to sign up for regular email alerts so that you know when prices change. You can also download a 'Petrol Prices Pro' app for smart phones at £2.99 a year so that you can find the best prices across the UK when you are on the move.

4.2 CAR CHOICES:

Choose the best car for the environment and for your pocket:

- Opt for the smallest car that suits your needs
- The less fuel you use, the less you pollute
- Newer cars are generally better for the environment
- Road tax is based on the amount of CO_2 your car emits
- Manual cars generally use less fuel than automatic cars
- LPG and diesel give out less CO_2 than petrol cars
- LPG and petrol cars give out fewer toxic emissions than diesel cars
- Cars with very low CO_2 emissions get a discount on the London Congestion Charge

Find more on the AA's website at www.theaa.com

4.3 ECO-DRIVING TECHNIQUES: GET MORE OUT OF THE FUEL YOU BUY

Fuel consumption has a lot to do with the car you buy, but whatever you drive there are things you can do to save money and reduce energy use, CO_2 emissions and pollution. They are simple ideas that really make a difference.

Maintenance

Servicing: Get the car serviced regularly (according to the manufacturer's schedule) to maintain engine efficiency.

Engine oil: make sure you use the right specification of engine oil (check the handbook).

Tires: check tire pressure regularly and before long journeys; under-inflated tires create more rolling resistance and so use more fuel (check the handbook and increase pressures for heavier loads as recommended).

Before you go

Lose weight: extra weight means extra fuel so if there's anything in the boot you don't need on the journey take it out.

Streamline: roof-racks and boxes add wind resistance and so increase fuel consumption. If you don't need it take it off — if you do, pack carefully to reduce drag

Leave promptly: don't start the engine until you're ready to go as idling wastes fuel and the engine warms up more quickly when you're moving; in the winter, scrape ice rather than leave the car idling to warm it up.

Don't get lost: plan unfamiliar journeys to reduce the risk of getting lost and check the traffic news before you leave.

Combine short trips: cold starts use more fuel so it pays to combine errands such as buying the paper, dropping off the recycling, or picking up the kids.

Consider alternatives: if it's a short journey (a couple of miles or so) consider walking or cycling rather than taking the car.

En route

Easy does it: drive smoothly, accelerate gently and read the road ahead to avoid unnecessary braking.

Decelerate smoothly: when you have to slow down or to stop, decelerate smoothly by releasing the accelerator in time, leaving the car in gear.

Rolling: the more you keep the car moving the better. Stopping then starting again uses more fuel than rolling.

Change up earlier: don't labour the engine but try changing up at an engine speed of around 2,000 rpm in a diesel car or around 2,500 rpm in a petrol car. This can make such a difference that all cars in the future are likely to be fitted with a 'gear shift indicator' light to show the most efficient gear change points.

Cut down on A/C: air-conditioning increases fuel consumption at low speeds, but at higher speeds the effects are less noticeable. So if it's a hot day open the windows around town and save the air conditioning for high speed driving. Don't leave the air-conditioning on all the time but aim to run it at least once a week throughout the year to keep the system in good condition.

Turn it off: electrical loads increase fuel consumption, so turn off your heated rear windscreen, demister blowers and headlights, when you don't need them.

Stick to speed limits: the faster you go the greater the fuel consumption and pollution. Driving at 70 mph uses up to 9% more fuel than at 60 mph and up to 15% more than at 50 mph. Cruising at 80 mph can use up to 25% more fuel than at 70 mph.

Don't be idle: if you do get caught in a queue, avoid wasting fuel — turn the engine off if it looks like you could be waiting for more than three minutes.

Measuring fuel consumption

Calculate average fuel consumption over any period by following these steps:

1. Fill the tank and record the mileage
2. Keep a record of any subsequent fuel purchases (you don't have to completely fill the tank again until you're ready to work out your mpg). Ideally go back to the same pump at the same garage you first filled the car and fill the tank again to the same level.
3. Now divide the total mileage since the first fill by the total number of liters used and then multiply by 4.546 to get miles per gallon (for example if you've covered 1000 miles and used 101 liters of fuel, your average mpg = (1000/101) × 4.546 = 45 mpg).

5.0 INSTALLING AFFORDABLE ENERGY EFFICIENT EQUIPMENT AT HOME

5.1 LIGHTING

Energy efficient lighting is another confusing topic. Traditional light bulbs (also known as tungsten bulbs or incandescent lamps) contained argon gas and a very fine tungsten filament. Electricity passes through the filament which glows and heats up to a temperature of over 2000°C. Consequently at least half of the energy used is lost as heat. Due to their inefficiency, these types of light bulbs are no longer available in the UK.

IN MOST HOMES, LIGHTING ACCOUNTS FOR 10-15% OF THE ELECTRICITY BILL.

SOURCE: WWW.THISISMONEY.CO.UK

There are now three main types of energy saving light bulbs:

Halogen bulbs produce a bright light that resembles sunlight. They use 20 to 30% less energy than incandescent lamps but still get very hot.

Compact fluorescent lamps (CFL) are 4 to 6 times more efficient than incandescent bulbs because they heat up less. However, they can be slow to emit a good level of brightness.

Light-emitting diodes (LED) are the most expensive but the most efficient bulbs available. They can last 25 to 30 years and use 90% less electricity than incandescent bulbs. They will light up immediately.

Before heading off to the shops though, make sure that you check the old lamp to see what type of fitting or 'cap' you require. There are two main types:

Bayonet fittings

Edison screw fittings

Often the fittings may be coded on the packaging.

B22 or BC means a standard size bayonet fitting

B15 or SBC means a small bayonet fitting

E27 or ES means a standard Edison screw fitting

E14 or SES means a small Edison screw fitting

Another common type of fitting is the GU10. This is a two pin fitting usually found on spot lights.

5.2 HEATING

Insulating tanks and pipes

Lagging water tanks and pipes reduces the amount of heat that escapes, so you spend less money heating water up, and hot water stays hotter for longer.

Insulating your hot water cylinder is one of the easiest ways to save energy and therefore money. If you already have a jacket fitted, check the thickness, it should be at least 75 mm thick. If not, it's worth treating your cylinder to a new winter coat. Fitting a British Standard jacket around your cylinder will cut heat loss by over 75% and save you around £45 a year - more than the cost of the jacket which is around £15.

By slipping pipe insulation around your exposed hot water pipes you'll keep your hot water hotter for longer. Fitting insulation to pipes is easy if the pipes are accessible; if your pipes are hard to reach, you may need professional help. DIY pipe insulation costs around £10 and saves around £15 a year. (Savings based on a gas-heated three bedroom semi-detached house.)

Controls

The right heating controls will let you keep your home at a comfortable temperature without wasting fuel or heat — so you'll reduce your carbon dioxide emissions and spend less on heating bills.

Room thermostats

These prevent your home from getting warmer than it needs to be. They will turn the heating on until the room reaches a pre-set temperature, and then off until the temperature drops.

Your room thermostat should be set to the lowest comfortable temperature — typically between 18°C and 21°C. Try turning your thermostat down a degree or two and seeing if you still feel comfortable. You don't need to turn your thermostat up when it is colder outside: the house will heat up to the set temperature whatever the weather. It may take a little longer on colder days, so you might want to set your heating to come on earlier in the winter.

Thermostatic radiator valves (TRVs)

Thermostatic radiator valves do not control the boiler, they reduce the flow of water through the radiator that they are fitted to, when the room temperature goes above a certain setting. Set them to the level you want for the room (a lower setting uses less energy and will save you money).

Cylinder thermostat

If your hot water is stored in a cylinder, the thermostat will prevent it from being hotter than it needs to be. Once the water has reached the temperature you have set, the heat supply from the boiler will be turned off.

Cylinder thermostats are usually fitted between one quarter and one third of the way up the cylinder. They are marked with temperature scales. They should be set between 60°C and 65°C. This is hot enough to kill off harmful bacteria in the water, but it is also hot enough to scald.

Boiler thermostat

Your boiler will usually have a dial on it, marked in numbers or Min and Max. This sets the temperature of the water that will be pumped from the boiler through the radiators to heat your home. The higher this is set, the quicker and more effectively the system will heat your home. In fact, if this is not set high enough, when it is very cold outside your home may not reach your desired temperature.

Alternatively, if your boiler is an old G-rated model, you can consider replacing it with a condensing boiler. Added to improved heated controls, this could save you as much as £235 a year. With a heat only boiler, some heat is wasted in the form of hot gases released from the flue. A condensing boiler captures some of the heat from these gases and uses it to heat water returning from your central heating system. It therefore requires less heat from the burner and is more efficient.

Programmer or time control

This will automatically switch your heating off when you're not home, or when you can do without it, such as when you're in bed.

Programmers allow you to set ON and OFF time periods. Most models will let you set the central heating and domestic hot water to go on and off at different times.

Choose a cold evening and time how long it takes for your house to warm up from cold to a comfortable temperature – this is the warm-up time. Then turn the heating off completely and time how long it takes for the house to start to get uncomfortably cold – this is the cool-down time.

You can now set your timers including the warm up and cool down time. So, for example, you can make sure that the heating goes on with a warm-up time before you wake up and turns off before you leave the house.

How much can you save?

Here are the average savings you could make in a typical three-bedroom semi-detached home, heated by gas:

- **Install a room thermostat:** £70 and 280 kg carbon dioxide a year.
- **Fit a hot water tank thermostat:** £30 and 130 kg carbon dioxide a year.
- **Fit a hot water tank insulation jacket:** £45 and 170 kg carbon dioxide a year.

You can also make savings by using your controls more effectively:

- **Turn down your room thermostat by one degree:** save around £65 and 260 kg carbon dioxide a year.

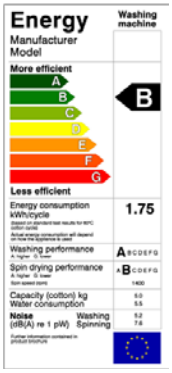
5.3 ELECTRICAL APPLIANCES

You can usually find the power rating expressed in kW or W stamped on the bottom of the appliance. To calculate the amount of energy each appliance uses we simply multiply the power by the number of hours used. So an 800 W microwave oven used for 15 minutes would use 800 x 0.25 = 200Wh or 0.2 kWh. The table to the right shows the energy consumption of some common household appliances together with the proportion of that consumed by standby power.

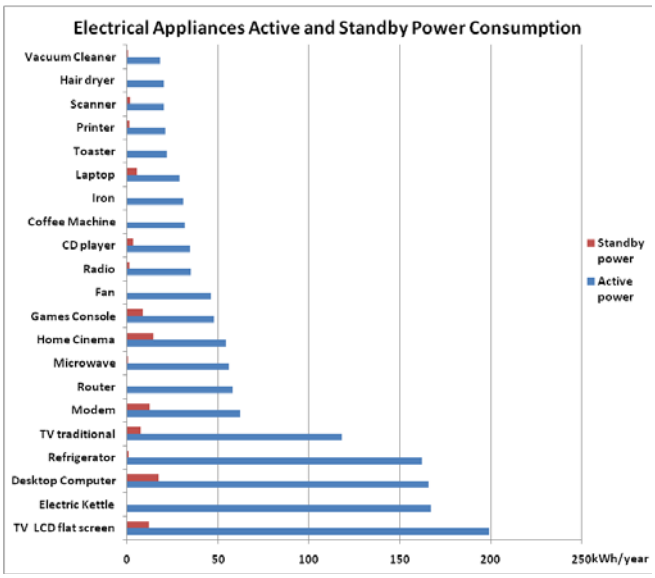
Standby power is electricity used by appliances and equipment even when they are switched OFF. A large number of electrical appliances cannot be switched off completely without being unplugged. These products draw power 24 hours a day often without the knowledge of the consumer. Typically standby power amounts to around 10% of residential electricity use.

If you're not certain how much energy your appliances consume, you can buy a low cost energy meter (typically around £10). You simply plug this into your electrical socket, plug your appliance into the energy meter and see how much is being used.

When shopping for new appliances always look out for the mandatory energy label (shown below left). These are really important because the cost of energy used by an appliance over its lifetime often adds up to more than the original purchase price. The label gives an energy efficiency rating scale which provides a simple index of the product's efficiency from **A** the most efficient to **G** the least efficient.



Other labels you may see are the Energy Saving Trust Recommended logo and the Energy Star label. Both of these labels are voluntary and manufacturers apply to get their products accredited. The Energy Saving Trust is a non-profit organisation funded by the UK government and the private sector. The labels are normally found on washing machines, tumble dryers, boilers, hot water cylinders etc. The Energy Star labelling scheme was originally developed in the US but is now available as a European Energy Star and is normally



found on types of office equipment like computers, monitors, printers and fax machines.

6.0 INSTALLING RENEWABLE ENERGY EQUIPMENT

Home renewables are good for the environment and good for your pocket too. Low-carbon technologies such as wind turbines, solar panels and biomass boilers let you generate your own energy, saving money and reducing your carbon footprint in the process.

There are lots of good reasons to use renewables. You will be:

- Making use of secure, local resources
- Reducing your dependence on non-renewable energy
- Helping to keep the air clean
- Helping to reduce the production of carbon dioxide and other greenhouse gases creating new jobs in renewable energy industries
- Saving and even earning money

6.1 SOLAR THERMAL

Solar water heating systems use solar panels, called collectors, fitted to your roof. These collect heat from the sun and use it to heat up water which is stored in a hot water cylinder. A boiler or immersion heater can be used as a back up to heat the water further to reach the temperature you want.

The cost of installing a typical solar water heating system is around £4,800 (including VAT at 5%). Savings are moderate — the system could provide most of your hot water in the summer, but much less during colder weather. Typical savings from a well-installed and properly used system are £60 per year when replacing gas heating and £85 per year when replacing electric immersion heating; however, savings will vary from user to user

You'll need around five square metres of roof space which faces east to west through south and receives direct sunlight for the main part of the day. The panels don't have to be mounted on a roof: they can be fixed to a frame on a flat roof or hanging from a wall.

If a dedicated solar cylinder is not already installed then you will usually need to replace the existing cylinder, or add a dedicated cylinder with a solar heating coil. Most conventional boiler and hot water cylinder systems are compatible with solar water heating. But if your boiler is a combination boiler and you don't currently have a hot water tank, a solar hot water system may not be compatible.

A competent accredited installer will be able to assess your home and help you choose the best setup to meet your needs.

6.2 SOLAR PHOTOVOLTAIC

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells don't need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting.

PV cells are made from layers of semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on your roof.

The power of a PV cell is measured in kilowatts peak (kWp). That's the rate at which it generates energy at peak performance in full direct sunlight during the summer. PV cells come in a variety of shapes and sizes. Most PV systems are made up of panels that fit on top of an existing roof, but you can also fit solar tiles.

Costs

The average domestic solar PV system is 3.5 to 4 kWp and costs an average of £7,000 (including VAT at 5%), with the typical cost ranging from £5,500 to £9,500.

Savings

A 3.5 kWp system can generate around 3,000 kilowatt hours of electricity a year – about three quarters of a typical household's electricity needs. It will save over a tonne of carbon dioxide every year.

If your system is eligible for the Feed-In Tariff scheme (see **SECTION 7**), it could generate savings and income of around £645 a year (based on a 3.5 kWp solar PV system eligible for a generation tariff of 15.44 p/kWh). You will get paid for both the electricity you generate and use, and what you don't use and export to the grid. When applying for FITs you will need to show evidence of your property's Energy Performance Certificate and this will affect what tariff you can get.

6.3 HEAT PUMPS

Heat pumps are renewable energy products which use small amounts of energy collected from the ground or air to transfer heat from one location to another providing a total heating and hot water solution for a property. As the renewable energy extracted is free, the only cost incurred when collecting energy for Heat pumps is the electricity required to run them, which also means they have some impact on the environment.

Air source heat pumps absorb heat from the outside air and ground source heat pumps (GSHPs) use pipes which are buried in the garden to extract heat from the ground.

This heat can then be used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. Generally, they perform better with underfloor heating systems or warm air heating than with radiator-based systems because they work much more efficiently at a lower temperature than a standard boiler system would.

Air source heat pumps are usually easier to install than ground source as they don't need any trenches or drilling, but they are often less efficient than GSHPs.

Heat pumps can lower your fuel bills, especially if you are replacing conventional electric heating, with average savings of around £500 a year; they may not be the best option for homes using mains gas, in which case it could cost more to run the heat pump than the system you are replacing.

Costs vary between £6000 and £10,000 for air source pumps and between £9,000 and £17,000 for GSHPs. Running costs will vary depending on a number of factors including: the size of your home, how well insulated it is, and what room temperatures you are aiming to achieve.

Heat pump systems typically come with a 10 year warranty. You can expect them to operate for 20 years or more, but they do require regular scheduled maintenance. A yearly check by you and a more detailed check by a professional installer every three to five years should be sufficient.

You may be able to receive payments for the heat you generate using a heat pump through the government's Renewable Heat Incentive (RHI). This scheme should be launched in summer 2013. (See **SECTION 7**)

7.0 SOURCES OF FINANCIAL HELP

7.1 FEED-IN TARIFFS SCHEME (FITs)

If you install an electricity-generating technology from a renewable or low-carbon source such as solar PV or wind turbine, the UK Government's Feed-In Tariffs scheme (FITs) could mean that you get money from your energy supplier.

You can be paid for the electricity you generate, even if you use it yourself, and for any surplus electricity you export to the grid. And of course you'll also save money on your electricity bill, because you'll be using your own electricity.

Most domestic technologies qualify for the scheme, including: solar electricity (PV) (roof mounted or stand alone), wind turbines (building mounted or free standing), hydroelectricity, anaerobic digesters and micro combined heat and power (CHP).

If you are eligible to receive FITs you will benefit in three ways:

- **Generation tariff:** your energy supplier will pay you a set rate for each unit (or kWh) of electricity you generate. Once your system has been registered, the tariff levels are guaranteed for the period of the tariff (up to 20 years) and are index-linked. For a solar PV that produces up to 4 kW, the tariff rate is around 14.5 p/kWh. (Valid until 30th June 2013)
- **Export tariff:** you will get a further 4.5 p/kWh from your energy supplier for each unit you export back to the electricity grid, so you can sell any electricity you generate but don't use yourself. This rate is the same for all technologies. At some stage smart meters will be installed to measure what you export, but until then it is estimated as being 50% of the electricity you generate (only systems above 30 kWp need to have an export meter fitted, and a domestic system is unlikely to be that big).
- **Energy bill savings:** you will be making savings on your electricity bills because generating electricity to power your appliances means you don't have to buy as much electricity from your energy supplier. The amount you save will vary depending how much of the electricity you use on site.

Registering for FITs

Once your chosen installer has installed your generating technology, take these steps to register for FITs:

1. Ask your installer to register you on the central MCS database. The installer will then send you a certificate confirming MCS compliance.
2. Tell your chosen FIT supplier that you wish to register for the FIT and send them:
   - A completed application form
   - The MCS certificate
   - For solar PV, the Energy Performance Certificate that shows your home has an energy efficiency rating band **D** or better.

Your FIT supplier will confirm your eligibility and the date you are eligible for payments from and agree with you if and when you will need to provide meter readings and when they will make FIT payments to you — these will form part of your statement of FIT terms.

7.2 THE GREEN DEAL

The Green deal is an innovative financing mechanism that lets people pay for energy-efficiency improvements through savings on their energy bills.

Green Deal was launched in January 2013 and applies to both the domestic and non-domestic sector. It replaces current policies such as the Carbon

Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP).

Through the Green deal, you can make energy-saving improvements to your home or business without having to pay all the costs upfront. Energy-saving improvements include: insulation, heating, draught-proofing, double glazing or renewable energy technologies.

First, you need to choose a Green deal assessor who will come and inspect your property and discuss your energy use. They will also give you a Green deal advice report which will explain what improvements you can make and estimate how much you could save on your energy bills. After the assessment, contact a Green deal provider. They can then arrange for any work to be done.

The amount you repay for Green deal improvements is based on what a typical household or business is expected to save on energy bills by having the work done. Most improvements should reduce your heating bill because you'll be using less electricity, gas or oil — but the actual savings depend on your energy use and the future cost of energy.

You will pay the money back through your electricity bills, which should stay about the same as they were before the improvement, but include both your consumption and the repayment. This also helps Green deal stay with the property: if you move, you no longer benefit from the improvements and therefore stop paying for them.

All Green deal organizations must be authorized-look for the quality mark.

7.3 RENEWABLE HEAT INCENTIVE (RHI)

The Renewable Heat Incentive (RHI) is a UK Government scheme set up to encourage uptake of renewable heat technologies among households, communities and businesses through the provision of financial incentives. The UK Government expects the RHI to make a significant contribution towards their 2020 ambition of having 12 per cent of heating coming from renewable sources. The Renewable Heat Incentive is the first of its kind in the world.

The domestic element of the RHI, is expected to be introduced in the summer of 2013 following the UK Government consultation published in September 2012. The key proposals in the consultation are:

- Indicative tariff ranges for air source heat pumps (6.9-11.5 p/kWh), biomass boilers (5.2-8.7 p/kWh), ground source heat pumps (12.5-17.3 p/kWh) and solar thermal technologies (17.3 p/kWh) that are MCS certified and meet relevant required standards, including specific emission limits for biomass systems.
- Payments for householders over seven years for each kWh of heat produced for the expected lifetime of the renewable technology and based on deemed heat usage.
- Tariff levels set to provide a better return for households living off the gas grid.
- Minimum energy efficiency requirements based on Green deal assessments.

8.0 SOURCES OF FURTHER INFORMATION

Part of the information found in this document is provided by the sources listed below. Visit their websites to find out more about energy saving at home.

SECTION 2:

- www.which.co.uk/switch
- www.moneysupermarket.com/gasandelectricity
- www.moneyexpert.com/energy
- www.uswitch.com/gas-electricity/guides/energy-bills/

SECTION 4:

- www.theaa.com/motoring_advice/fuels-and-environment/drive-smart.html
- www.petrolprices.com
- http://www.moneysavingexpert.com/travel/car-check

SECTIONS 3, 5 AND 6:

- Energy Saving Trust- www.est.org.uk
- National Energy Foundation: www.greenenergy.org.uk

SECTION 7:

- https://www.gov.uk/green-deal-energy-saving-measures
- www.energysavingtrust.org.uk/Generating-energy/Getting-money-back

9.0 ACTION PLAN

- [ ] Learn to understand my energy bills
- [ ] Switch energy supplier
- [ ] Check thickness of loft insulation and increase if less than 270 mm
- [ ] Insulate cavity/solid walls
- [ ] Proof draughts
- [ ] Install double-glazing
- [ ] Install heavy curtains
- [ ] Install energy-saving light bulbs
- [ ] Insulate tank and pipes
- [ ] Install room/boiler/heater thermostat
- [ ] Turn thermostat down by 1 degree
- [ ] Buy a low cost energy meter and check how much energy my appliances consume
- [ ] Learn to understand energy labels
- [ ] Find the cheapest petrol stations in my area
- [ ] Get my car serviced according to the schedule
- [ ] Check if I use the right specification of engine oil
- [ ] Check tire pressure
- [ ] Take out anything I don't need from my car
- [ ] Calculate my average fuel consumption
- [ ] Evaluate possible options of renewable energy equipment for my home
- [ ] Understand how the Feed-in tariffs programme works
- [ ] Arrange an appointment with a Green Deal advisor and discuss possible improvements

BE THE CHANGE YOU WANT TO SEE IN THE WORLD

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