

SUSTAINABLE LIVING PROGRAMME 2014 EDITION (DRAFT)

ENERGY ACTIONS – GAIN HOME ENERGY EFFICIENCY



Here is a practical approach for householders who share our concern about energy costs and global warming and want to take action locally, where it is possible to make a difference. In this section, you will learn how to:

- reduce energy demand by keeping winter heat inside, where it's wanted, avoiding leaks of heat and therefore wasted money
- make good use of free heat from the sun, all year (with shading at the west to control over-heating)
- use any 'fossil carbon' fuels (coal, oil, or gas) required for energy services within your house as efficiently as possible, to minimise CO₂ emissions and to get best value
- plan for any new purchased energy-using equipment to be the most efficient affordable.

START WITH 10 ENERGY SAVERS FOR FREE

Many actions that save heating fuels or reduce electricity use need cost nothing but your time or some thought. Here are some tried and tested ones, to help you make a start:

1. **Does your hot tap water run very hot?** Over a third of NZ homes surveyed for the Housing End-use Energy Project (HEEP) had dangerously hot water at the tap: between 60 and 70 degrees Centigrade. This was due to tank thermostats set too high or to faulty thermostats. If using electric or gas water heating where the water storage cylinder has a thermostat fitted to control heat input, adjust it down to not exceed 60°C, so that water from the hot taps flows at no more than 50°C when tested after a minute. It will still be stored hot enough to control bacteria in the water (to protect your health) but will be less likely to scald a child's skin at the tap, and you will need less energy to keep it hot.
2. **Do you leave the house ablaze with lights** and perhaps the television running in an empty room? Light bulbs turn power into light and heat, so apart from their winter contribution to warming, you are wasting the power (10 x filament bulbs each rated at 100 watt are equal to a 1kW electric radiant heater). Re-lighting them when needed does not use as much power as leaving them on. This advice applies to your computer and television set too.
3. **Do you need hot water in every clothes wash?** Using a cold-wash detergent will cut your gas or electric water-heating costs. Run the machine only with full loads.



Cold wash with a suitable detergent gets clothes clean with much less energy cost. See our shopping guide for more info.

4. **Once dusk falls close the curtains.** Keep room heat in. Glass still loses heat, but more slowly when insulated from the room's warm air by lined curtains under a pelmet or by close-fitting fabric blinds. Venetian blinds are not effective insulation as they allow too much air movement.
5. If you have central heating controls, **turn down the room thermostat or heat pump control.** If you've been running this set at above 21°C, cutting down to 19 °C may reduce your heating bills by 10% without reducing your comfort. And while you think of 'turning down', do you need an electric towel rail or heat pump left on 24hrs? Use timers.
6. **Cool surroundings suit refrigerators** (interior at 4°C) **and freezers** (at -16°C). They work best in cooler areas of your house on the south side and not when right next to the oven or a room heater, nor under a sunny window. Also, they are most efficient when the heat-exchange coils at the back are well ventilated and clear from dust – an occasional brushing there aids air circulation. Not opening an upright fridge or freezer door too often or for very long, helps its efficiency, so it pays to be well-organised, to get several items out or returned at once! Defrosting improves fridge efficiency too. Older fridges tend to be less efficient and less insulated than modern designs, so that 'beer fridge' chugging away in the hot garage may be using much more power than the newer kitchen one.
7. **Do you really need an electric dryer for clothes drying?** Every time you dry outdoors you save energy (75c per load in power) and UV light in sunshine helps to kill bacteria

and house mites too! Better still, put a clothesline under a carport, pergola or other covered area for when it rains.



Line drying is the energy-efficient choice; and the UV freshens!

Although sunlight fades colours, tumble drying wears out clothes faster, so they have to be replaced sooner (that lint collecting on the dryer's hot-air filters comes from wear of fabrics). Vented dryers do have their uses though, as it's more energy efficient to use a dryer for a few minutes than to dry clothing on racks indoors when it's raining, and then rely on use of dehumidifiers or heaters for hours afterwards to dry out the resulting moisture.

8. **Use flat-bottomed pans, with lids**, on an electric cooking stove, to get maximum value from the power used. With gas, keep flames set low. Simmer rather than boil, to reduce steam production.

9. **Microwave ovens use 30% to 40% less power** for heating than conventional electric ovens or jugs (kettles) so if you have both available, consider using the microwave for defrosting items, light cooking of vegetables and warming cupfuls of liquids.

10. A money saver on electric bills could be **shopping around between the retail suppliers**. Find out whether you are getting best value by looking at your latest electricity bill and then checking the competitor's prices at the independent Consumer Institute PowerSwitch website: www.consumer.org.nz/powerswitch/default.asp

Another useful webpage is offered by Community Energy Action Christchurch (ph. 03 363 9854) comparing advantages and disadvantages including running costs for several different types of heating <http://www.cea.co.nz/energy-information/#heating>

NOW FOR YOUR NEXT STEP AFTER THE FREE ACTIONS: TEN ENERGY-SAVING INVESTMENTS, AT A LOW COST

We say "investments", because they involve spending a little now, in order to "save more later".

1. **Low energy lighting**. The no-extra-cost ideas above will save you more than enough to buy your first low-

energy light bulbs. A compact fluorescent bulb of 20 watt power consumption or an LED of around 8 watts gives equivalent light output to a traditional 100 watt filament bulb, for a fifth of the electricity consumption. They typically cost more than filament bulbs but will last at least five times as long before burning out, saving on the electricity bill and bulb replacements all the while. The savings in power used pay for the bulb within half a year, and the saving continues each year. Available in bayonet and screw fittings to fit standard light sockets, CFLs show the best power-bill savings in rooms where lights are on for at least two hours at a time, such as kitchen, hallway, sitting room. They are less suitable for bathroom, toilet, garage, shed and pantry, where their noticeable warm-up time (an initially dull light that brightens within 30 seconds) may be a disadvantage. There's a competitively-priced selection in the shops, and a choice of bulb shapes. LED lighting is evolving fast, becoming most cost competitive and looks like it will be the best in the long term (discussed at <http://www.mnn.com/earth-matters/energy/stories/should-i-buy-led-or-cfl-light-bulbs>) partly because LED's don't have the mercury-disposal issues that CFL's do For more info see <http://www.energywise.govt.nz/tools/lighting>.

2. **Efficient fridge doors**. Did you know that, on average, a fridge and freezer can use up to twice as much electricity per year than kitchen ranges/ovens, because they're working 24hrs a day! If choosing a new fridge, look for at least 3.5 stars on the energy efficiency label. Each extra star is an efficiency gain of about 10%



Check the air-seals on your fridge door - replace if perished and leaking air

Check the seals on upright fridge and freezer doors. If they are not tight enough to hold a piece of paper trapped in place when the door is closed, room heat is leaking in, and the fridge will have to work harder to keep food cool. Look for parts sources in Yellow Pages or ask at a retailer – they pay for themselves through energy efficiency in a few years. If it's an older fridge and seems to be running for long periods each day it may have a faulty thermostat – about one in 5 in the HEEP survey did! Unnecessary running could frost-damage food and run up excess bills. An old beer fridge used in a hot garage during summer will be the least efficient of them all! (That's a beer tax)

In New Zealand EECA is responsible for regulation of a **Minimum Energy Performance Scheme (MEPS)**, including mandatory labelling. We have MEPS for new fridges and freezers, electric hot water cylinders, air conditioners, TVs, gas water heating, solar water heating and fluorescent lamps.

<http://www.energywise.govt.nz/sites/all/files/Products%20at%20a%20glance%202013%2004%2001.pdf>

3. **Stop whistling draughts.** Draughts can steal away up to 20% of the warm air from your home. Blocking an open fireplace chimney with a chimney balloon or permanently with board or bricks is the best first action. Next steps are sealing any gaps in glazing, panelling, around window frames and the exterior doors. Hardware stores stock many varieties of draught-stop strips, brushes and sealing caulks, so do expect to have a choice. Typical costs of draught strips are \$1 to \$1.50 per metre. You can make draught-stopper 'sausages' or 'snakes' to place at internal doors, from old scraps of fabric, stuffed with tights or cushion filling.

If you have a woodstove or logburner, all the air going up the flue is air from the house which you've already heated. Can you introduce outside air by pipe to somewhere near the fire?

Ventilation

A safety and comfort note: Avoid using a LPG gas bottle heater, a portable gas stove/oven or any other device burning fuel indoors without its own ventilation! If you have one, you must **ensure it has a constant air supply** – which may mean putting up with a draught – and also ensure that the **toxic fumes** (carbon monoxide and dioxide, nitrogen oxides, sulphur dioxide) and **water vapour** from the fuel burning escapes from those rooms. Damp houses are more expensive to heat.

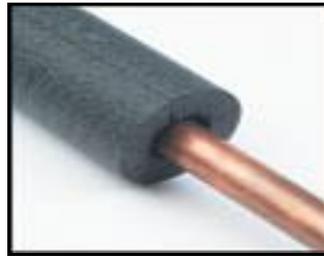
Ventilation of steam is especially important in kitchens and bathroom.

You may need small but secure window openings or to install a quiet extractor fan, perhaps on a timer switch, or the house air will be generally damp.

4. **Enjoy hot water, cheaper.** Your copper hot water tank at home would not keep water warm for long without an insulation layer around it. Modern tanks are quite well insulated at the factory, shown by the label 'Water Mark Grade A', so it is worth checking for this.

Older hot water tanks (18 years+) had less insulation when they were constructed and they lose heat steadily into the surrounding space – perhaps handy for clothes airing, but expensive in power bills, adding at least 50c per day. To cut this loss, an insulating jacket or 'cylinder wrap' can be fitted around the tank provided you have 10cm space around it. Typically the wrap is made of polyester or wool, sandwiched between foil and a plastic or cotton outer layer, and can be installed for under \$120. You should set the tank top heating thermostat in the range 55°C to 60°C. These small measures pay for themselves in power bill savings in a year or two, then go on saving.

Lengths of pipe containing hot water will radiate energy, so pipe wrapping of the first few metres from the hot tank helps to keep the heat where it is wanted: in the water.



Split insulation sleeve fits around copper hot-water pipes

Start any DIY pipe insulation at the hot water tank, where temperatures are high all the time. Once you have lagged the pipes you may find that the water arrives significantly hotter at the tap, so the tank thermostat temperature can be reduced by a few degrees, but not lower than 60°C at the tank (for your health protection). The saving on energy costs could gain a pay-back time of under two years on the cost of insulation, so it's well worthwhile.



Hot baths use 3x more energy than short showers – but there may be times when a long relaxing soak (maybe with a plastic duck) is what you need! If not, why not take out the bath and install a shower.

You are reading the Energy Saving Action notes from NZ's Sustainable Living Programme, 2014 edition

If not already an evening class or learning group participant, why not have fun learning about sustainability in a group? You can get details for your region of NZ at our website www.sustainableliving.org.nz

5. **Cosier behind curtains.** Windows without curtains or shutters lose a great deal of heat to cold night air outside, even on clear summer nights. Curtains with linings, providing a layer of trapped-air insulation, are more effective at keeping heat in the room than a single layer, and they also resist the colour-fading effect of ultra-violet light in sunshine through the north and west-facing windows. Plain pale-colour or reflective curtains to hang on the window side of your existing patterned ones can be obtained ready-made in a variety of sizes at

modest cost, as can the fabric to sew your own. A pelmet 'ledge' that traps air above the curtain rail or track also aids energy efficiency.

If your funds are very limited, curtains can be bought second-hand or even obtained free by Community Services Card holders at 'curtain banks' in Christchurch, Auckland and Hamilton from Energy Action Groups (ask your group leader or Local Council).



For comfort, Margaret has curtains with separate white linings, to trap air and prolong the printed curtain's life in sunlight. The sliding door is double-glazed too.

Curtains are less expensive than double-glazed windows and show faster pay-back in terms of energy savings.

Another **alternative to double-glazing windows is a plastic window kit**: a clear plastic film, attached to the inside of the window frame by double-sided adhesive tape, and shrunk-to fit with a hair-dryer or fan heater. The adhesive tape can make a mess of painted window frames, and are suitable only for windows that are not opened in the winter. Cost varies with size of frame to be covered but note that the larger the window the more vulnerable it is to stretching and damage. DIY window film kits (and a range of other insulation materials including tank and pipe wraps) can be obtained by mail order catalogue from Megawatt Resources, Freepost 110268, PO Box 38 028, Wellington Mail Centre; also by post from Community Energy Action in Christchurch, www.cea.co.nz/retail-shop/#Window%20kit, EcoMatters Environment Centre in Auckland <http://www.ecomatters.org.nz> or they might be available in local hardware stores.

6. **Shower flow savings.** You are probably aware that a short shower requires one to two-thirds less hot water than a bath, but did you know that some shower-head designs spray out twice as much hot water per minute than the 6 to 9 litres per minute that you need for a pleasant, effective shower? Measure your shower's flow by catching the water in a container for a timed 15 seconds and multiplying the volume measured by four to give litres per minute. Screw-threaded shower-heads are usually replaceable, so why not see if a water-saving one is available to fit your water pressure (either

mains or tank – noting that the largest savings can be made on high mains pressure hot water systems). Expect it to pay for itself in energy savings within one to two years. Low flow shower heads can reduce flow from 20 litres per minute to about 7, saving over \$100 a year without spoiling your showering. Another device is a flow reducing plastic washer that can be inserted behind the screw-in shower head – typically these come as a set of three, giving options of 20%, 35% or 50% flow reductions. Similar alterations can be made to hot taps on sinks, by screw-fit 'aerators' which add air to the hot water flow. Look for these in plumbers' merchants or larger hardware stores: they are often Australian imports.



Showers are great hot water savers compared to baths

7. **Cut "overhead" losses.** Above the ceilings of your home, in the roof space, another layer of insulation helps to keep heat inside (where you want it in winter), and also to stop an overheated roof space in mid-summer from warming the rooms below. Hundreds of thousands of older NZ houses have no insulation, and many have only a few centimetres thickness of fibre-glass or blow-in ceiling insulation, which is far less than the thickness now required to meet Building Code in new buildings. See pdf from Dept Building and Housing '*Your Guide to Smarter Insulation*' <http://www.dbh.govt.nz/UserFiles/File/Publications/Building/summer/your-guide-to-smarter-insulation.pdf>

You can improve on existing insulation by adding a second layer. If your home has little or no ceiling insulation, investment in insulation material (such as fibreglass, polypropylene or wool batts rather than blown-in paper fluff) will keep heat in and significantly improve comfort whilst reducing the heating bills. Aim for a layer of at least 12cm depth of insulation if there is none present. Wrap the blankets or batts around and over (but not under) the water tank, to protect it from freezing.

Another aid to warmth in winter in high ceiling rooms is a fan, positioned centrally on the ceiling, with blades set to send warm air back down (often they can be operated both ways, dragging in fresh cooler air from the outside in summer).

If you are a house owner and occupier you may be eligible for financial help with insulation of the ceilings (and also under-floor; see #8 below) and replacement of open fireplaces with cleaner heating. For example,

- in Christchurch and Timaru contact Clean Heat Project of Environment Canterbury 03 353 9276 or <http://www.cleanheat.org.nz/>
- In Auckland see: *Retrofit your Home*. <http://www.aucklandcouncil.govt.nz/EN/ratesbuildingproperty/sustainablehomes/Pages/retrofityourhome.aspx>
- In Wellington and Hutt valley see Greater Wellington financial loan assistance for insulation, via Rates <http://www.gw.govt.nz/gw-s-offer/>

If you are a landlord or tenant then EECA are offering grants towards the cost of insulation in rental properties.

<http://www.eeca.govt.nz/eeca-programmes-and-funding/programmes/homes/insulation-programme>

Several cities and districts have energy action schemes similar to Christchurch Community Energy Action (ph. 03 374 5698) and Huntly Energy Efficiency Trust (ph. 07 828 8004) - teams of experienced people installing insulation and lagging hot water tanks, at low cost for rental house landlords and low-income house owners. Full list at

<http://www.communityenergy.org.nz/>. Outside those cities and towns contact EECA www.eeca.govt.nz

Check the 'Yellow Pages' or ask at your Council offices for local information on the options available and any schemes specifically to assist people in rented housing, or living on low incomes. The colder the part of New Zealand you live in, the greater the saving on heating bills that result - and the faster the 'pay-back' for your investment. The improved comfort and reduced condensation starts right away!

8. **Warmer underfoot.** Once you have tackled ceiling insulation, in wooden houses with a cavity below them, draughts and radiated heat loss through the floor can be reduced by installing insulation under the floor joists. This can be installed at about \$8 to \$10 per square metre, but is practical for the home installer only if you have at least a 65cm deep access space, or as narrow as 45cm for experienced professionals. Payback time in energy cost-savings is longer than for ceiling insulation (mostly because heat rises and cold air falls), but should still be under five years, which is a good investment for house owners. Take care if DIY-installing such insulation under floor joists, as stapling into power cables has caused several electrocutions!



Lisa has warmer feet on the board floors now that the floor is insulated underneath.

9. **Enjoy natural summer shade.** Create summer shading but retain winter light by planting a deciduous tree a

few metres away from north and west-facing windows, instead of relying on electric-powered fans or air-conditioning equipment to cool an over-heated room. Or simply use outside awnings, or interior blinds or lined curtains. Even climbing sweet peas, or runner beans outside a West-facing window could do the trick in summer, and be cleared for winter.



Deciduous trees near the north and west of the house can provide welcome summer shade. In winter, they let in warm sunlight at lower angles through their bare branches. Get advice before planting, on trees whose roots will not damage buried pipes. Window shading at the north and west by the house structure is also important.

10. **Limit power waste with timers.** Timers can be handy to pre-set heating such as oil-filled radiators, heated towel rails and bathroom fans to come at convenient times of day, warming the room ready for you and switching off automatically



Margaret pre-sets her lounge radiator to give winter heat at the right times of day - it has a built-in 24hr time clock and a thermostat. Buy time switches or movement-sensing switches for lights that are not needed often and can safely be turned off between-times. There are

also light-sensors available that switch off an outside light circuit during daylight.

HERE ARE TEN 'ENERGY DESIGN' CONSIDERATIONS FOR WHEN BUILDING A NEW HOUSE, AN EXTENSION OR RENOVATING.

It's not every-day running expenses for households covered in this section, but some ideas for investment in energy efficiency if you have to renew plumbing, windows, walls, roof, or tackle major building work; or some things to look for when you move home:

1. **Water heating by sunshine.** If you have to buy a hot water tank and install new plumbing, consider solar water heating or solar PV (electricity generating panels) or a heat pump as a fuel-saving supplement to using electricity or a gas-burner as water heater. Solar water heating can meet household needs for perhaps half of the year in at least the northern two thirds of New Zealand.
<http://www.energywise.govt.nz/how-to-be-energy-efficient/your-house/hot-water/solar-water-heating>



Solar water-heating panels can be metal or plastic, fitted onto or into the roof, and are usually glass-glazed, over either a black heat plate or a set of parallel glass tubes. Compare systems and ask for test results.

2. **Double glaze windows on the colder sides.** If you have to order new or replacement windows, consider having a smaller glazed area and double-glazed windows on the south walls and living spaces, to reduce heat losses and condensation. The double glass plus the sealed gap between them lose significantly less heat in winter than single glazing. They also reduce condensation. (*There's more information in our Building topic handouts.*) Add curtains too.

3. **Cunning lighting design and controls.** Use compact fluorescent lights (CFLs), and light emitting diodes (LEDs) to light your rooms attractively and with energy-efficiency. Avoid adding spotlights that are fitted through the ceiling (downlights) as they will 'leak' heat in air draughts from the room into the roof space above. Note that downlight bulbs need ventilation for fire safety and can not be covered above.

Use movement-detecting switches in garages, toilets and outside to light entrance paths, if required. An alternative approach providing soft- glowing rather than bright garden lighting is solar lights, whose built-in battery is charged during the day for free by sunshine (photovoltaic, or PV for short). No buried cables required for these.



Compact fluorescent light bulbs are longer-lasting and run on a fifth of the power of conventional filament bulbs. Margaret has replaced all her old bulbs with this type, and cut running costs.

If you need brighter, commercial-type flood-lighting for garage workshops or exterior yard, you can get low-temperature compact fluorescents instead of mercury vapour lamps, or better still, check out what is available in LED spot-lighting, the range of which is expanding all the time.

4. **Wrap up the walls.** Up to 25% of an un-insulated house's heat loss goes out through the walls. Insulating walls in addition to ceiling and floor *at construction time* is far more affordable and effective than adding it afterwards (the Building Code suggests a minimum insulation standard for walls of R1.9, and ceilings R2.9 in the North Island, or R3.3 in the South Island). See the additional study notes on Home Energy Efficiency (our *Building topic*) for some available choices of insulation materials.



Many brands & types of insulation are available – but ask for the type that best suits your task..

5. **Passive solar design.** Avoid both summer overheating and winter chills by designing a fairly large area of north-facing glazing to catch winter sunlight, but also use eaves or overhead shading to limit mid-summer heat gain, when the hot sun is at its highest angle. Design the solid structure of the house floors and interior walls to absorb sunshine by day and release it at night, creating more comfortable and stable day-night temperatures. This requires some 'thermal mass' (usually concrete floors or block or stone walls) that are exposed to the sun, restricts carpet in those sun-heated areas and will not

work as well in all-wood houses. It also requires insulation outside walls and ceiling to both keep in the winter warmth and reduce summer over-heating. The cooler sides of the house to the south should have reduced areas of window, and to the west to limit overheating, plenty of wall insulation and double-glazing. (Architects or engineers can calculate the likely annual energy performance of the building's design before it is constructed, using a computer programme called ALF3, available from BRANZ. An easier web-based tool for the lay person is Design Navigator) <http://www.designnavigator.co.nz/DNTutorial.php>)

Two useful booklets for those considering a new energy-efficient home, or about to tackle major renovations, are:

- **Easy Guide to Eco Building** available free from BRANZ ph. 0800 80 80 85 (*your study leader may have a paper or electronic copy*). http://www.branz.co.nz/cms_show_download.php?id=85fa46c13fef0555c863241092bded4ea6e09f57
- **Designing Comfortable Homes:** guidelines on the use of glass, mass and insulation for energy efficiency, from the Cement and Concrete Association of NZ ph. 04 499 8820 or freefax 0800 222 717 (the summary booklet is free, or the full book \$23 plus GST)
- Look for information on insulation at EcoDesign website <http://www.ecodesignadvisor.org.nz/factsheets/> 6.

Either keep hot pipe runs short or heat the water where required. Design for the hot water cylinder to be as close as possible to where hot water will be used, minimising the length of pipe runs (even if lagged), and reducing the amount of water you need to send down the drain before it arrives hot enough for use. Sometimes a small under-sink 'instant' electric water heater (connected to the mains pressure cold water supply) will be the most energy-efficient option, for example at a laundry tub or a hand basin near a toilet in another part of the house, if it is quite far from the hot tank.

7. **Install low-energy appliances.** Fridges, freezers, ovens, washing machines dishwashers, TVs, computers and other appliances together use 20% of household energy, so it is useful to know that new "Energy Star" best models are becoming available that use significantly less energy than their predecessors, for the same work. A growing range of such whiteware and appliances is available in New Zealand.



See www.energystar.govt.nz

Also look for displayed Energy Efficiency rating labels when shopping around and seek best star performance – 4 as a minimum. **Each extra star represents about a 10% efficiency increase.** Remember that because of features such

as extra insulation or more efficient motors and pumps, they may cost a little extra to buy.

Think about the value of electricity savings over the expected lifetime of such equipment (at least 10 years) when you shortlist your whiteware choices, as the design efficiency should pay for itself fully in power savings! The NZ and Australian Consumer Institutes regularly survey members' experience of appliance brand reliability/durability and test new models for performance including both energy and water efficiency. www.consumer.org.nz



Look for these Energy labels on new whiteware, (on both imports and NZ-made). Aim for more than 4 white stars shown in the red, but, also...Read the numbers - the smaller refrigerator labelled on the left consumes fewer kWh in a year. Larger volumes need more energy, even when running efficiently.

8. **Avoid creating damp.** Ventilation, especially for kitchen, laundry and bathroom, keeps the house dry. Dry air takes less energy to heat and controlling the humidity reduces asthma and allergy-triggering mould and house-mites. Any house can be naturally ventilated to some degree. Opening windows or doors to allow the wind to blow through is a good first step. Air also rises with heat, so opening a lower window on the windy side and a higher one downwind – particularly if you have a two-storey house – will assist the flow. A two-storey house with a pitched roof can be designed to have natural ventilation, in which warm air rises up the staircase to higher level windows and then vents outside. Well sealed modern houses may need some ventilation assistance designed-in using heat exchange that swaps heat from outgoing air into the incoming air, in winter. Otherwise, small fans are not expensive to run. Solar-electric powered vent fans are available

Avoid using portable gas heaters because they give off toxic fumes (there is no chimney). They also emit water vapour, which then makes the air harder to heat and can encourage mould when water condenses on cold walls. If you provide lots of ventilation to get rid of fumes you may lose much of the warmed air too, so – if you want to burn gas for room heating - consider a wall-mounted or a fireplace-insert flued gas heater, perhaps one that distributes heat to radiators in several rooms (central heating). Gas-fired condensing boilers are also efficient for central heating.

9. **Replace your open fireplace.** Avoid this least energy-efficient of all heating methods. Open fires are very hungry for fuel without giving much heat, as up to 95% disappears up the chimney with the smoke. The same amount of dry wood burned in an enclosed wood-burner with an exposed flue-pipe above it, heats your room far better. If you have to buy the firewood, an open fire is also the most expensive way to heat your home.

If you must 'see a living flame', select a glass-fronted modern low-emission wood-stove and burn it always with lively yellow flames for maximum combustion of the wood. Wood pellet fires are also available. Flame-effect gas heaters are decorative but not efficient.

Burning local firewood is a practical way of using solar energy for heating and cooking. The CO₂ emitted when you burn it is not much different from that which would be emitted if the tree was allowed to decay in the forest. There is often a fossil-fuel component to firewood through the use of chainsaws and transportation, but nowhere near as big as when you use fossil-fuels alone to generate the heat (gas stoves, coal ranges, diesel heaters). Read more at <http://www.resilience.org/stories/2010-02-09/sustainable-firewood-recycling-atmospheric-carbon>

The drier the wood the better - you simply lose some of your heat boiling away the water in wet wood – and a good efficient burner is best.

Make sure that the heater is sized properly for the room so that they are not over or under-heating it: see the Consumer website on how to do this .

<http://www.consumer.org.nz/topic.asp?docid=63&category=Appliances&subcategory=Heating%20%26%20ventilation&topic=Choosing%20a%20heater&title=What%20size%20heater%3F&contenttype=calculator>

A useful guide to calculating the size you need is:

- to allow about 44 watts per cubic metre of room volume.
- Add another 10 percent for a large window area and another 10 to 20 percent for partial or no insulation.
- If it's a lounge, multiply by 1.5. If it's a bedroom, make it 1.2, and for other areas multiply by 0.8.

Example: A well-insulated bedroom 3m x 4m x 2.4m high has a volume of 28.8 cubic metres. Multiply by 44 to get 1267 watts, and again by 1.2 to get 1520 watts (1.5kW) You can get oil-filled electric radiators of this size, whilst a wood stove would give far too large an output.

10. **Consider a heat pump if you like warm air circulating.** Using electricity more efficiently for air heating is the argument for Energy Star top efficiency heat pumps, as they shift up to 5kW of heat inside from the outside air for each 1kW required to run them (transferring energy from air like a refrigerator does, from a colder place, outdoors, into a warmer place - your home's interior). It's important to keep filters clean on these heat pumps for them to stay efficient.

If you are renting

In this 'Energy' topic of the Sustainable Living programme, and in the Travel topic, we offer information to help you understand and reduce your household's contribution to global-warming. Also, by reducing fuel and electric power consumption through efficiency, you can both save money and have a more comfortable and healthy home. We aim to show that it's possible for people and the planet to benefit together!

However, the actions are perhaps easier to organise if you own your house or flat. What our information may not be able to influence so readily is cold and damp **rented housing**, if your landlord has been (so far) unwilling to make investments in heat-insulation, draft control, better ventilation and clean/efficient/affordable room and water heating systems. However, there are grants available to help improve insulation in private and State rented housing and these grant funds can be extended by councils participating in the development of rental Warrant of Fitness assessments. Read more:

http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10884051

If you are a tenant and this situation applies, ask at the local Council office, (or Housing NZ, or WINZ) if energy audits are available locally so that you can get the facts on how energy inefficient your home is - if not, at least this enquiry generates demand for provision of these audits - and also ask about EECA grants for landlords. Report any asthma, bronchitis, depression or other health difficulties potentially related to cold, damp and mould growth at your home. It is still worth reading these Energy Action notes from Sustainable Living to see what you can do yourself, especially the first section 'free actions', but perhaps to make a note separately of what your landlord (whether private or public sector) could do, to play their part. For information on *EnergyWise* programmes for landlords and tenants see <http://www.eecn.org.nz/index.html>

Within Maori society, several runanga are active in partnerships with the Energy Efficiency and Conservation Authority (EECA) to make energy efficiency improvements in State or local Council rented housing.

If you hold a **Community Services Card** and live in a **house that was built before 2000**, you may be eligible for a subsidy to insulate your house. This applies to both home owners and tenants. To find out if grant-assisted energy improvements could be made to your house, contact EECA at 0800 358 676, and ask if there are there any projects which subsidise the cost of insulation or heating operating in your area. Your electricity retailer should also know about any insulation projects in your area, so call them and ask.

These notes were revised in 2009 and again in 2014 by a team including Sustainable Living tutors, EcoDesign advisors, Community Energy Action and EECA. Thanks to all contributors
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