Energy at home

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Energy – seeing the big picture

Basic forms of energy: radiant, chemical, thermal, mechanical, electrical. In Maori tradition, energy is an even broader concept - energy flows include the living vibrations of the land and its people, present and past.

Energy-flows are essential to human life. Muscles use energy to do the work of living, such as our heartbeat, breathing, walking and digesting food (even when resting).

Our personal energy supply is from food, especially carbohydrates (such as potato and grain starches, sugar in fruit), fats (butter, oils, meats, some seeds) and proteins (including beans, meat, fish, nuts and grains). Eating meat from animals is less energy-efficient than eating plants directly.

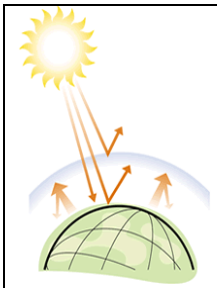
Photosynthesis – plants capture energy from sunlight and use it to make carbohydrates in their green cells from soil minerals, carbon dioxide (CO_2) and water.

The Law of Conservation of Energy:
You can't create or destroy energy but it can change form. The total energy of a closed system is constant.

Fossil fuels – solid coal, liquid oil and pockets of gas formed over hundreds of millions of years from ancient forests and peat swamps. Fossil are called non-renewable because once burnt, or used, they are gone for good. We may have already reached the point where annual world oil and gas demand has exceeded production, see website: www.peakoil.net

Our rate of fossil fuel use in transport, electricity generation and industrial processes has grown rapidly, and with it our CO_2 emissions.

Global warming in simple terms



Picture from NZ Climate Change Office

Natural greenhouse effect
Sun's energy trapped by water vapour and gases in the atmosphere. It is a natural process but recently (100+ years) there's an

Enhanced greenhouse effect
Earth is being heated up by the thickening 'blanket' of greenhouse gases including carbon compounds from burning forests and fossil fuel sources, plus livestock gut methane gas emissions and agricultural nitrous oxide, plus extra water vapour in highest- altitude clouds (from jet aircraft).

Most scientists believe that extra greenhouse gas emissions from human activity are large contributors to global climate change. Global concern in the 1990s led to the Kyoto Protocol that committed developed countries such as NZ, Japan and the EU to reduce their greenhouse gas output. There has been resistance to ratifying the Protocol by the USA and Australia.

Kyoto Protocol - as a signatory, NZ's target is to reduce greenhouse gas emissions to 1990 levels, by 2012 (currently our emissions are more than 5% above 1990 levels) by:

- reducing emissions of greenhouse gases.
- growing forests (which absorb CO_2 from the atmosphere) to offset emissions.
- helping other countries to reduce emissions.

The New Zealand Government has released a policy package that will assist us to achieve our target. This can be found on www.climatechange.govt.nz.

Burning the fossil carbon store releases CO_2 gas. Fossil fuels are a limited 'resource' that is being burnt millions of times faster than the rate at which carbon was originally stored, from sunshine, by nature.

Electricity generation by burning coal or gas releases CO_2. In contrast, electricity generated from hydro lake storage, wind generators or geothermal steam, does not release CO_2.

Burning wood also releases CO_2 but because trees absorb CO_2 from the atmosphere to grow, the total impact of burning wood is neutral on carbon balance.

Measurements show that **the concentration of CO_2 in the atmosphere is now higher than at any time during at least the past 420,000 years,** if not several million years. It's grown beyond natural variation.

Living on a greenhouse planet

There is increasing evidence that the Earth is **already** warming up, leading to:

- shrinking glaciers and sea ice.
- changes to flowering times of plants.
- changes to migration patterns of birds.
- greater variability in weather, which may have major agricultural impacts such as floods and droughts.
- a rise in sea levels which can threaten coastal areas (often densely populated).

For NZ, global warming could mean:

- a rise in average sea level by perhaps 10cm by 2030 and 40cm by 2100.
- up to twice the frequency of heavy rain and associated floods (especially in the west).

- more droughts on east coasts of NZ and a one degree rise in average temperatures by 2030.
- snow lines and glaciers will retreat. Some ski fields close.
- the temperature change will begin altering the growing regions of crops and distribution of pest insects.
- we would have more uncomfortably-hot summer days in cities, too, especially in Auckland and Christchurch.

Now that climate change has started, it is very hard to stop. Our past and present emissions of greenhouse gases have already committed the Earth to a substantial warming that will continue for the rest of the 21st century, and sea-level rises will continue for several more centuries.

Energy use in New Zealand

NZ electricity generation - hydro-power is largest proportion. There's also geothermal steam, gas and coal. However, the % of our electricity being generated by burning fossil fuels is increasing. The largest contributor to carbon dioxide emissions from NZ households is the oil & petrol use in vehicles.

So far, NZ has stayed non-nuclear. Let's keep it that way by limiting growth in electricity demand!

Rediscovering alternatives - solar water-heating, making solar-electricity (photo-voltaics), passive-solar house design, wind generation, use of wood (deemed carbon neutral if trees planted) and bio-fuels (crops grown for energy content).

At home, should we switch from burning fuels for heat to electric heating?
If you use electric heating you cause at least twice as much CO_2 to be released as you would if you burned the same amount of fuel directly at your house in an **efficient and clean** central heating

Energy Actions– Gain Home Energy Efficiency

10 energy savers for free

1. Adjust hot water cylinder thermostat to the range 55 to 60°C.
2. Turn off lights and appliances when not in use.
3. Clothes washing - use a cold-wash cycle (& detergent), run the machine only with full loads.
4. Once dusk falls in winter, close curtains to keep the room heat in.
5. If you can, turn down the room thermostat and turn off the electric towel rail in the bathroom in summer.
6. Keep fridges and freezers well ventilated and in cool surroundings if possible. Regular defrosting improves fridge efficiency too.
7. Dry clothes outdoors instead of using the clothes dryer.
8. Use flat-bottomed pans, with lids on an electric cooking stove. With gas, keep flames set low. Simmer rather than boil.
9. When there's a choice, use your microwave oven rather than your conventional oven.
10. Save money on electric bills by shopping around between the retail suppliers. Check prices at the independent Consumer Institute PowerSwitch website: www.consumer.org.nz/powerswitch/default.asp

Ten energy savers, at low cost

"Spend a little now, to save more later."

1. Use low energy lighting – compact fluorescent bulbs will pay for themselves in a short time.
2. Replace any fridge or freezer seals which are not effective. Stop using a second, old, 'beer' fridge.
3. Stop draughts around doors, windows and block up unused open fireplaces. Remember to allow for ventilation of steam in kitchens & bathrooms.
4. Lag your hot water tank (especially if it is an older one) and also lag any exposed hot water pipes.
5. Lined or thermal curtains help to keep heat in
6. Change to a "Low Flow" shower head to save water and energy.
7. Add extra depth of ceiling insulation.
8. Install underfloor insulation (and damp-proofing).
9. Use shade (awnings or trees) to keep cooler in summer, rather than use fans/air conditioners.
10. Limit outdoor lighting with timers or sensors.

Ten energy design considerations when building new or renovating your home

1. Install solar water heating.
2. Double glaze windows.
3. Use compact fluorescent lights plus low-voltage spotlight circuits to light your rooms attractively and with energy-efficiency. Use movement-detecting switches in garages, toilets and outside to light paths, if required. Outside, consider solar lights.
4. Insulate walls, plus ceiling and floor at time of construction.
5. Passive solar design - e.g. large area of north-facing glazing to catch winter sunlight, eaves to limit mid-summer heat gain. Design the solid structure of the house interior to absorb sunshine by day and release it at night. Few south windows.
6. Keep water pipe runs from the tank short to minimise the length of hot pipe losing heat.
7. Install new low-energy appliances.
8. Avoid damp. Ventilating out, especially for kitchen, laundry and bathroom, keeps the house dry.
9. Don't install or keep in use an open fireplace.
10. If you are happy with warm air circulating rather than a radiant heat source, consider a heat pump.

For more detailed information refer to the website
www.sustainableliving.org.nz