



RETROFITTING BUILDINGS TO REDUCE GREENHOUSE GAS EMISSIONS

Retrofitting - why it matters

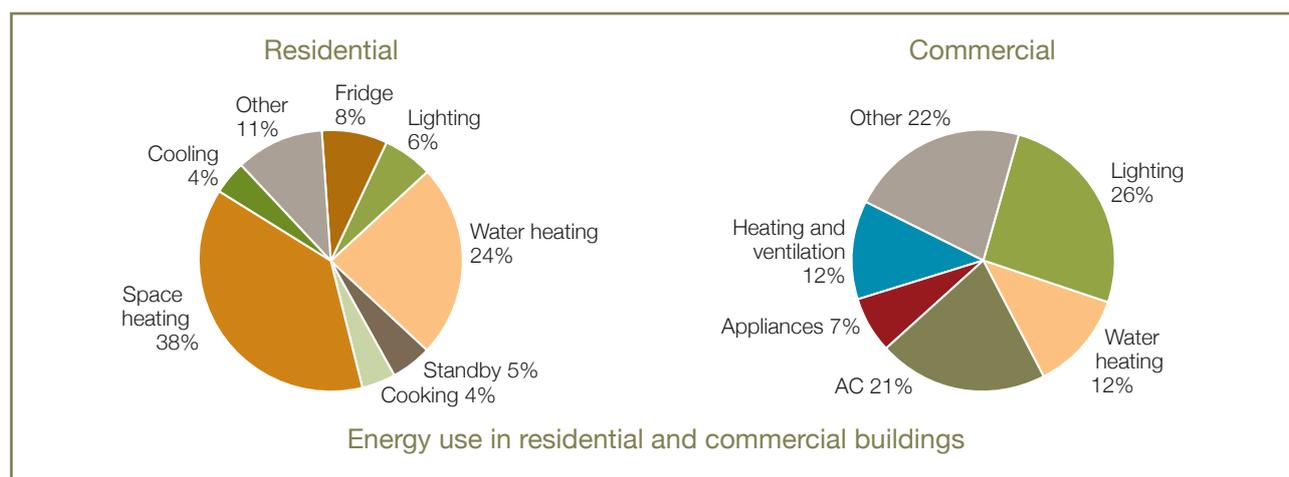
Retrofitting your house can save money, energy, the environment and provide a more comfortable home. Retrofitting a home through extensive insulation, draught proofing and efficient appliances can typically save about \$700 and reduce energy use by up to 50% annually. Installing a solar hot water system can increase this saving to about \$1500 and reduce energy use by about 80% annually.

Background

Canberrans have a high awareness of energy saving options but there is still a long way to go in taking action. At least two-thirds of ACT households are aware of Green Energy but only a little over 7% currently buy Green Energy (Downie 2009; ABS 2004). At least a third of ACT houses still lack adequate insulation and energy efficient lights. Less than 10% of houses have solar hot water systems (Blakers 2005).

Our per capita use of both electricity and gas continues to increase. Our use of these energy sources to heat, cool and light our buildings accounts for 72.2% of our greenhouse gas emissions (in 2005) (Office of the Commissioner for Sustainability and the Environment 2007).

Energy use patterns and rating systems vary markedly in residential and commercial buildings so these must be considered separately, see the figure below.



The ACT Government has a long-term goal of carbon neutrality, to achieve zero net emissions, by 2060. Retrofitting of homes and buildings could achieve big energy and money savings whilst reducing greenhouse gas emissions.

Benefits of Retrofitting

Mass retrofitting of buildings can deliver significant economic and environmental benefits. Retrofitting offers a viable solution to reducing GHG emissions and can offer associated cost, comfort and environmental benefits. For example, Trevor Pearcey House in Bruce achieved a reduction of energy use of about 75% by installing insulation, double-glazing windows, utilising natural ventilation and lighting (Office of the Commissioner for Sustainability and the Environment 2007).

Electricity bills can be reduced by retrofitting for energy efficiency. Smart retrofitting will mean household budgets will be better able to cope with predicted rises in electricity prices. Many of the strategies here apply equally to the commercial and industrial sectors, reducing operating costs and potentially making them more competitive. Retrofits for a simple household pay for themselves over time as shown in the table below

Health and comfort are increased through retrofitting. Drafts are removed from inside buildings and temperature fluctuations are reduced. Respiratory diseases are lower because of reduced exposure to fumes from heating systems and the movement of airborne dust (Levi et al 2003).

The major environmental benefits are that retrofitted buildings use less energy, have lower GHG emissions and produce less local air pollution (Blakers 2005).

Strategies for retrofitting houses

Actions that can be taken without any change to behaviour are shown in the table below. Initial costs of taking all 5 actions at around \$5,000 would be paid back in less than 2.5 years, delivering annual savings of about \$1500 thereafter.

Average costs and savings from simple household retrofitting¹

Priority	Improvements	Payback Time (years)	Annual CO2e reduction (kg)	Cost to install	Annual Savings
1	AAA shower head	0.4	1010	\$120 (DIY)	\$300
2	Weather Stripping	0.6	72	\$14 (DIY)	\$25
3	Compact fluorescent lights	1.6	345	\$100	\$60
4	Ceiling Insulation	3.4	1287	\$1,200	\$380
5	Solar hot water	3.3 – 5.8	2498	\$2,600 – \$4,600 (Inc. rebates)	\$780
	All	3.3 years	5212 kg	\$5,000	\$1,545

¹ Figures are based on an average of 3.6 people in a household, GHG emissions factors of .89kg per kWh, an average daily use of 2.2 hours per lightbulb (as used by the DCCEE Greenloans program), an average of 177KI/year of water use per Canberran household (National Water Commission).



Retrofitted energy efficient house, Lyneham ACT



Simple and cost-effective retrofitting actions

Pay particular attention to high impact issues - non-renewable heating and cooling

- Electric and gas space heating, and electric heating, cooling, water heating and refrigeration account for about 75% of total energy use and greenhouse gas emissions from houses
- You can cut out about 10% of energy and emissions for every degree that you DON'T heat or cool. So setting the winter thermostat to 20° C instead of 22° C will save 20%

Manage sun penetration - Minimise summer solar gain and maximise desirable winter sun

- Plant deciduous trees on the north and west sides of your home
- Install insulated blinds, especially on western-facing windows, to keep out hot sun on summer afternoons

Save water and energy while showering

- AAA grade shower heads cost around \$120 and can be installed by home owners. The modern ones reduce water (and energy) by about half, and feel just as good to the user
- Solar hot water systems have improved in both cost and functionality in recent years. Government rebates continue for installation, making pay-back relatively quick. A great option, even for our cold climate

Use daylight when the sun shines and efficient lighting when it doesn't

- Open the windows during the day and turn off the lights - see which spaces are light enough for you to use
- Think about how you use each space and consider whether any lights can be moved or removed
- Choose compact fluorescent lights or Light Emitting Diodes (LEDs) instead of old-style incandescent bulbs

Cross ventilate for a healthy environment

- Cross ventilation only happens when entering air has an escape route, so create paths for breezes to cool rooms in use during summer
- Open windows when the temperature is comfortable outside. Remember to shut them again when it is not. Usually this means keeping windows shut at night time in winter and daytime in summer
- Flush the internal airspace clean using natural cross-ventilation

Re-organise internal planning - use zoning and air locks

- Zoning allows you to only heat or cool the spaces you are living in. Shut the doors to spare bedrooms, toilets, bathrooms and laundries and don't heat or cool them along with the rest of the house
- An air lock at each doorway makes a buffer between outside and inside temperatures - keeping the temperature comfortable where you want it

Good insulation - ceiling insulation is by far the most important, but there are other options too

- Any gaps will undermine the benefits, so have insulation professionally fitted
- Under-floor insulation can stop drafts and increase comfort. Especially good for wooden floorboards
- Some buildings can easily have insulation sprayed into wall cavities. Ask an expert

WHAT CAN I DO
IN MY HOME?



Select energy efficient products - whenever you get the chance

- If it is time to get a new fridge, washing machine, dishwasher etc, buy the right sized appliance with the highest number of energy and water stars

Use thermal mass - most heavy items will store heat energy and release it slowly to balance fluctuations

- Trombe walls are internal structures providing thermal mass, inside a house. They are usually short brick walls, inside full-length north-facing windows to capture winter sun and provide free heating at night. Curtains between window and wall need to be opened in the morning and closed at night
- A large, metal tub of water placed near a heater, or in the sun during the day can also act as thermal mass
- Concrete floors that receive winter sun will be warm in winter and cool in summer. Watch where the sun hits them and don't block this benefit with carpet or rugs

Monitor and continually improve

- Start with easy and cost-effective options and add some new energy-saving options each year
- Products such as Centimeters and digital displays show household energy use in real time. These are a great educational tool and a motivating factor for residents. They are available from retailers of electrical equipment with some units costing under \$500

Useful websites

Sustainable House Day, Canberra

www.sustainablehouseday.com/australian-capital-territory.php

The buildings sector and greenhouse: Key Facts

www.yourbuilding.org/library/carbonfootprint.pdf

The Green House: It's Easy Being Green

www.gbca.org.au

The Department of the Environment, Climate Change, Energy and Water

www.environment.act.gov.au

References

Blakers, A. 2005 'Solar energy in the built environment'. Manning Clark House forum Making Canberra Sustainable (17-18 October 2005)

Downie, G. 2009 'Our Power is Greener: ACTEWGL' available at <http://www.canberratimes.com.au/news/local/news/general/our-power-is-greener-actew-agl/1434326.aspx>

Levi, J. Nishioka, Y and Spengler, J. 'The public health benefits of insulation retrofits in existing housing in the United States' Environmental Health: A Global Access Science Source. <http://www.ehjournal.net/content/2/1/4>

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