



Energy at Monash

a guide to reducing energy
consumption on campus

Produced by the Monash Green Office Program,
Occupational Health, Safety and Environment.



MONASH University

Greening up our act

Introduction

The environmental impacts of our energy usage in offices are often hidden – we don't see coal burning to produce electricity every time we turn on our lights and computers – yet its repercussions are becoming increasingly apparent.

Scientists now agree that increasing greenhouse gas emissions from human activities are contributing to climate change on a global scale. CSIRO predicts that Australia will face further water shortages, extreme weather patterns and a 1-6°C increase in temperature by 2070 over most of Australia.¹ These environmental changes also have serious economic and social implications.

Australia produces more greenhouse gas per capita than any other industrialised country.² If we are to avoid dangerous climate change, we must take actions to reduce our energy usage now.

Energy consumption at Monash

Monash University is one of the largest energy users in Victoria. In 2004, the Clayton campus alone used 51742 MWh of electricity, at a cost of approximately \$3.72M.³ This resulted in the release of 72.02 kT of greenhouse gases into the atmosphere – that's enough to light about 96 000 Australian homes!⁴

The following graph produced from electricity audits at all campuses shows that 43% of our energy usage is expended on air-

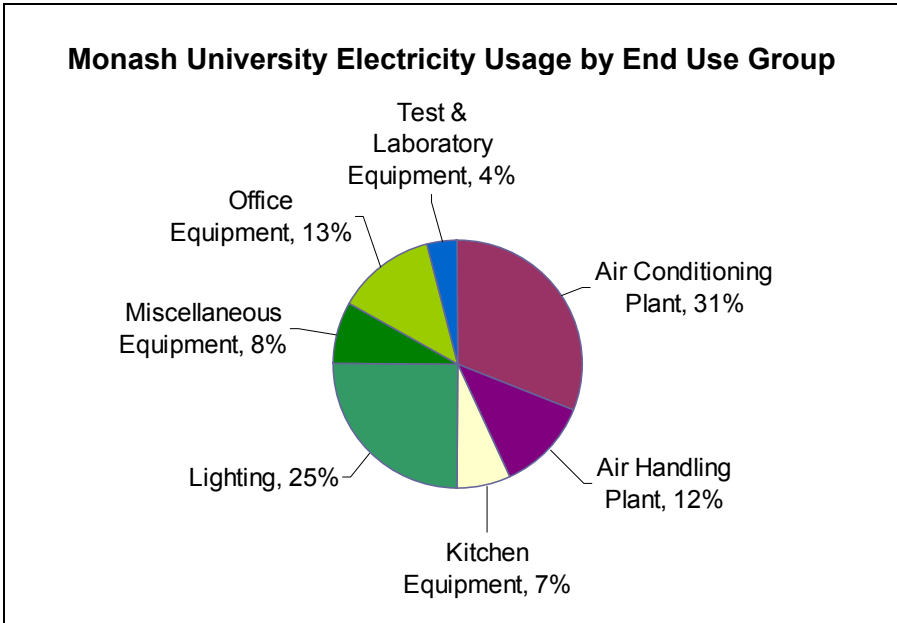
¹ Australian Greenhouse Office. 2007. "Climate Change Impacts and Adaption". Available online at www.greenhouse.gov.au/impacts/overview.html, accessed 10th January 2007.

² Turton, H. and Hamilton, C. 2001. "Comprehensive emissions per capita for industrialised countries", The Australia Institute, p. 4. Available online at www.tai.org.au/documents/downloads/WP30.pdf, accessed 10th January 2007.

³ Monash pays commercial electricity rates which are significantly lower than domestic rates.

⁴ Australian Greenhouse Office. 2007. 'Transport – how can I save?' Available online at www.greenhouse.gov.au/gwci/transport.html, accessed 16th January.

conditioning and air-handling equipment, 25% is used to light our buildings, and 13% used to power office equipment such as computers, printers and photocopiers.



Monash University's commitment to addressing climate change

In recognition of our responsibility to reduce emissions, the Vice Chancellor has committed Monash to a target of **20% reduction in energy consumption across all Australian campuses by 2010**. The target has two components; a 10% reduction to be achieved through infrastructural improvements, and a further 10% reduction from cultural change. The target aims for a reduction from 2005 levels – so Monash is really committed to saving extra since the demand for energy is currently rising every year.

It is important to note that the intent is to reduce environmental impact *not* costs, although this will be an additional benefit of reaching the target. Monash pays a premium to purchase a minimum of 10% energy from renewable sources⁵ at all campuses and offset emissions from fleet vehicles through Greenfleet,⁶ and plans to increase these contributions in future. As the first Australian university to commit to an energy reduction target, Monash is proud to be a leader in action on climate change.

So what can we do?

The University is working to improve the efficiency of buildings and other infrastructure - but this is only half the story. Meeting this target will require everyone to make smarter choices about the way energy is used in our daily activities. As staff members of Monash University, we belong to a community of over 5000 people, who influence thousands more students and visitors every year. Together, we are in a position to make a powerful difference to greenhouse gas emissions abatement.

Tell me about this guide!

This guide outlines easy steps you can take to reduce your energy usage at Monash. It contains the following topics:

1. Green lighting	4
2. Green air conditioning	6
3. Green computers	7
4. Green office equipment	9
5. Debunking common energy myths	10
6. Green transport	12
7. How else do we use energy?	14
8. Encouraging change in your office	15

⁵ Monash buys Green Power, which is government accredited clean, renewable energy sourced from the sun, the wind, water and waste. For more information, please see www.greenpower.gov.au/

⁶ For more information on Greenfleet, please see www.greenfleet.com/

1. Green lighting

Managing our use of lighting is one of the easiest ways to reduce energy. To reduce the environmental impact of lighting in your office:

- When the sun is shining outside, turn off your lights and let nature light your office free of charge!
- Turn your lights off whenever you leave your office - during meetings, lunch breaks and after hours.
- Encourage your colleagues to switch off lights in common areas such as meeting rooms, kitchens and toilets when these are not in use.

Take action (see back page) if lighting in your department or public spaces is...

- ...automatically controlled, and does not switch off outside working hours when not in use.
- ...controlled by a single switch in larger rooms or open plan areas. Request that lighting is split across several switches so that all lights do not need to be switched on at once.
- ...controlled by central switches that are inconvenient. Request that switches are moved to more accessible locations.
- ...excessive. Many office areas are lit above the Australian Standard, and it is possible to significantly reduce energy by 'de-lamping' (removing lights completely).

Where possible, Facilities & Services will carry out and finance energy-related projects. Particular attention should be paid to energy efficiency during future refurbishments.

How much energy do our office lights consume?

Use the following process to calculate the energy used by lights in your office. The results might come as a surprise!

Responsible Officer: Manager, OHSE

Date of last review: May 2007 Date of next review: May 2008

Step 1. Divide the wattage per fluorescent tube (36W) by 1000 to convert to kilowatts (kW). Multiply by the number of tubes in your office, then multiply by the number of hours your lights are switched on every day. This calculates the daily energy usage of your lights in kilowatt hours (kWh).

Step 2. Multiply by the number of working days per year to give an annual figure, then multiply by 0.065 to calculate the approximate financial cost of this electricity to Monash.⁷

Step 3. Multiply the annual energy usage of your lights by 1.325 to find the greenhouse gas emissions released (kg CO₂-e). You can then translate this figure into meaningful terms by dividing by 0.5 to give the emissions equivalent of kilometres travelled in an average car.⁸

Eg. 5m x 7m office of the Environmental Management team

- Step 1. $(36W/1000) \times 10 \text{ lights}^9 \times 8 \text{ hours} = 2.88 \text{ kWh}$
Step 2. $2.88\text{kWh} \times 240 \text{ working days} = 691.2 \text{ kWh per year}$
 $691.2 \text{ kWh} \times 0.065 \text{ cents} = \44.93
Step 3. $691.2 \text{ kWh} \times 1.325 = 915.84 \text{ kg CO}_2\text{-e}$
 $915.84 \text{ kg Co}_2\text{-e} / 0.5 = 1831.6 \text{ km equivalent travelled in average car}$

Over a year, the energy used to light our small office costs approximately \$45 and contributes the equivalent greenhouse emissions to driving over 1800km in a car.

Switching our lights off for just one extra hour per day and delamping one bank of lights would reduce electricity costs to only

⁷ Monash pays commercial electricity rates which are significantly lower than domestic rates.

⁸ Australian Greenhouse Office. 2007. 'Transport – how can I save?' Available online at www.greenhouse.gov.au/gwci/transport.html, accessed 16th January.

⁹ There are 5 banks of lighting in our office, with 2 fluorescent light tubes in each bank.

\$31 a year, and reduce our emissions by the equivalent of driving almost 550 km!

To find out how much power other types of lighting and equipment are using in your office, contact the Green Office Coordinator (see back page) to determine average values or borrow our power meter.

2. Green air conditioning

Is your building excessively heated or cooled? Air conditioning and air handling represents the largest usage of electricity on Monash campuses – even though many older buildings are not air conditioned. Every additional degree of cooling can contribute an extra 15% to running costs!¹⁰ Why not discuss this at your next staff meeting and propose trialling the adjustment of thermostats in your office by a few degrees for a month?

The temperature of many buildings is controlled automatically. Take action (see back page)...

- ...if your building is air conditioned to be cooler than 25-28°C in summer, or warmer than 19-20°C in winter.
- ...if your air conditioning does not switch off within 2 hours outside working hours.

To reduce the energy used to air condition your building:

- Dress appropriately – expect to need an extra layer inside during winter and lighter clothes in summer!
- Where a thermostat is accessible, adjust temperature ranges to 19-20°C in winter and 25-28°C in summer. Thermal comfort guidelines specify the range 19-28°C for offices.¹¹

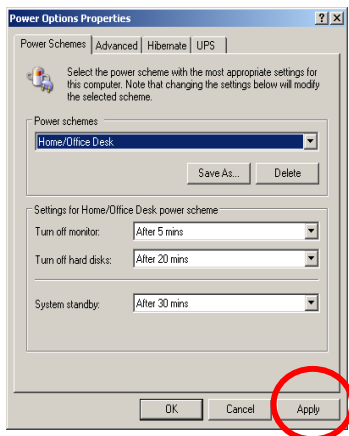
¹⁰ Australian Greenhouse Office. 2007. "Greenhouse Tips", Available online at www.greenhouse.gov.au/challenge/members/greenhousetips.html, accessed 10th January.

¹¹ Temperature ranges adapted from Australian Greenhouse Office recommendations. See ASHRAE 55-2004 for thermal comfort guidelines.

- Ensure the last person to leave every night is responsible for switching off air conditioning, and switch off earlier if possible.
- Do not use small fan heaters, which are prohibited on campus because they use massive amounts of energy, interfere with thermostats and are a fire hazard. If you do need extra heat, use an energy efficient 240 W panel heater.¹²
- Avoid package (split system/room) air conditioning systems as these are energy wasters. To discourage their use, these systems now attract a levy at Clayton campus which is directed towards purchasing more Green Power.

3. Green computers

A computer and monitor left on for a year will generate the same amount of carbon dioxide as a car travelling from Sydney to Perth.¹³ Fortunately, minimising the energy usage of your computer is easily achieved by altering its ‘power management’ settings. To reduce emissions from your computer:



- Go to Start>Settings>Control Panel>Power Options and adjust your power management settings to:

‘Turn off Monitor’ after 5-15 minutes,
 ‘Turn off Hard Disks’ after 20 minutes
 ‘System Standby’ after 30 minutes
 ‘System Hibernates’ after 4 hours¹⁴

Remember to click ‘Apply’! When you return, simply move your mouse or hit

¹² For example, an energy-efficient personal portable 240 W panel heater from Thermofilm (www.thermofilm.com.au).

¹³ Australian Greenhouse Office. 2007. Available online at www.energystar.gov.au/about, accessed January 2007.

¹⁴ Power management settings tested and recommended by Arts/IT.

the power switch to revive your computer.

Please note that screensavers – either animated or blank – do *not* save energy. For more information on energy myths, please see Section 5.

- These settings are occasionally reset when ITS load software and virus protection updates onto university computers. Submit a Green Action form (www.monash.edu.au/green/action/) requesting that power management settings be part of the ‘image’ that is copied onto computers in your department.
- Reduce the brightness of your screen using monitor controls.
- Ensure your computer and monitor are switched off during meetings, lunch breaks and outside working hours.
- During longer breaks, switch off at the power point and unplug the power cord from the socket. Equipment draws a small amount of power even when switched off, and this will also protect your hard drive and computer from possible power surge damage in your absence.

What is standby power?

Standby power is the electricity consumed by equipment which is switched off or not performing its primary function. In industrialised countries, it can represent up to 12% of household electricity consumption. Microwaves, for example, generally use more energy to power the clock than to heat food. This is because the microwave is used only occasionally, while the clock operates continuously.¹⁵

In Australia, standby power is estimated to cost consumers \$500 million every year, emitting more than 5 MT greenhouse gases.¹⁶

¹⁵ Economist. 2006. “Pulling the plug on standby power”, 9th May.

¹⁶ Energy Star. 2007. “About Energy Star, Available online at www.energystar.gov.au/about/index.html, accessed January 2007.

Activating power management features limits the energy wasted in standby power by automatically switching off equipment when not in use.

4. Green office equipment

Photocopiers and printers are two of the highest energy consuming pieces of equipment in the office, even though they can remain idle for as much as 95% of the day.¹⁷

Keep the following points in mind to reduce energy usage when you next copy or print a document:

- Minimise usage of this equipment (and reduce paper usage!) by printing and photocopying only when necessary, using the duplex (double-sided) option whenever possible.
- Investigate power management options for your equipment and activate low power, sleep or energy save modes.
- Ensure that the last person to leave the office every night is responsible for switching off equipment.

When purchasing or leasing new office equipment, select the most energy-efficient, value-for-money model:

- Purchase LCD (flat screen) instead of CRT (box) monitors, as these consume approximately 50% less energy.
- Ensure that all equipment and appliances conform to ENERGY STAR (www.energystar.gov.au/) requirements, and request that power management features are *enabled*.
- For office equipment that uses paper, specify capacity for duplex (double-sided) printing and a toner save mode.

¹⁷ Australian Greenhouse Office. 2007. Available online at www.energystar.gov.au/about accessed January 2007.

Remember that over the lifetime of your equipment, the cost of power and buying consumables such as toner cartridges and paper can be much more than the cost of the equipment itself!

5. Debunking common energy myths¹⁸

People often use office equipment in what they believe is a cost-effective and environmentally preferable way, when in fact what they are doing is exactly the opposite. Often they are acting on widely believed but wrong information, or they've had a bad experience with older models of equipment and don't realise that the problem doesn't apply to the newer models. Here are some of the more common dollar- and energy-wasting myths and the realities behind them.

Myth Screen savers save energy.

Reality Screen savers are energy wasters! Most computers use about twice as much energy lighting up the screen as they use for processing. Originally, screen savers were designed to stop screens being burnt by a constant image, but they aren't needed for modern screens. Not only can screen savers use as much energy as a full screen of work, but many require considerable processing energy as well. To save energy, enable power management on your computer (see Section 3).

Myth Turning off computers damages the hard drive.

Reality Switching off computers will have no significant effect on the useful lifetime of the hard disk. In the past larger hard drives were degraded by mechanical stress, but today some manufacturers specify a life of 40 000 power cycles for their hard drives. That is equivalent to 30 off/on cycles for each working day over five years.

Myth When lighting and equipment is turned on, or powers up from

¹⁸ This section adapted from Commonwealth of Australia. 2001. 'Green Office Guide: A guide to help you buy and use environmentally friendly office equipment', full document available on request from Green Office Coordinator (see back page).

standby modes, there is a current surge. The energy consumed during this current surge is so large that leaving your equipment in normal operating mode wastes less energy than turning it off or using power management features.

Reality Start-up current surges are of very short duration and at most they consume a few seconds of average running time energy. Whenever your lighting or equipment is not being used for more than a few minutes it makes sense to turn it off or switch to a lower power setting.

Myth Power managing equipment in winter means it will generate less heat in the office and the heating system will need to run longer.

Reality True, but it is far more efficient, cheaper and more environmentally sound to heat your building with a purpose-built heating system than have inefficiently operating office equipment leak heat into the workplace. In fact, most commercial office buildings use much more energy for cooling than for heating and power management of equipment can reduce the need for cooling considerably. This means that turning off lighting and equipment can save energy in two ways – directly, and by reducing the need for air conditioning.

Myth Turning off or power managing computers and printers causes network problems.

Reality Major network software suppliers say that if networks have been properly set up there should be no problem with turning off or power managing computers and printers in the network. If you are installing or upgrading a network, you can save energy by making effective power management capacity a mandatory condition of the contract. While servers need to be left on, they don't need their screens on after hours to assist processing.

6. Green transport

The environmental, social and economic impacts of over-reliance on cars challenges us to rethink the way we perceive private car travel, and explore alternative transport options to work and meetings.¹⁹ Monash staff are entitled to claim travel expenses when using bikes and public transport for work purposes.²⁰

- **If you live close to uni, walk to work.** Find a walking buddy and enjoy the fresh air.
- **On your bike!** A person on a bicycle is the most efficient creature on Earth in terms of travel for energy expended.²¹ Bikes are a cheap, healthy, sustainable and fun way to travel. Bicycle Victoria has tips and resources for experienced and first-time cyclists alike – check out their website at www.bv.com.au.
- **Catch public transport, or combine trains with a bike.** Time spent on a train, tram or bus is time gained to read, reflect and relax. To check timetables, fares and service alterations visit www.metlinkmelbourne.com.au/. Bikes can travel free on all trains, making this an extremely fast and flexible way to get around Melbourne.
- **Catch a shuttle bus.** Monash staff and students can access regular shuttle buses for a small fee between Clayton-Caulfield, Clayton-Berwick, Clayton-Peninsula and Berwick-Peninsula campuses. For details and to check timetables, see www.monash.edu.au/campuses/metro/shuttle.html.
- **Carpool with nearby colleagues.** Clayton staff and students have access to free carpool parking for vehicles carrying two or more people. To register visit <https://mdsadmin.monash.edu.au/cgi-bin/carpoolreg>. To offer

¹⁹ Transport is not included in our energy reduction target, but is discussed here because it contributes significantly to our environmental impact.

²⁰ For claim forms, please contact the Green Office Coordinator (see back page).

²¹ Based on 'effective speed' concept. For more information, see www.greenhouse.gov.au/tdm/publications/effectivespeed-concept.html.

or request lifts on any campus, log in to your 'my.monash portal', click the 'my community' tab, and 'carpool matching'.

- **Consider alternatives to travel.** Work from home occasionally and use video- or telephone-conferencing to avoid the need to commute to meetings.

Travelsmart (www.travelsmart.vic.gov.au) has produced excellent maps detailing alternative transport routes around Melbourne, which are available from the Green Office Coordinator (see back page). Why not pin these up in your office and implement a 'Green Transport Friday' in your department by challenging your colleagues to participate in green transport once a week?

Still reliant on your car?

To use less petrol, check your tyre pressure, tune your car frequently, drive slowly and smoothly and use green transport whenever possible. If you do need to purchase a car, keep these tips in mind:

- Check out second-hand cars to reduce embodied energy (see Section 7).
- Compare vehicles at www.greenvehicleguide.gov.au/ or check the 'Fuel Consumption' labels displayed on windscreens of new cars. Consider fuel-efficient hybrid cars or smaller, fuel-efficient diesel cars.
- Consider hiring taxis, renting vehicles or joining a carshare scheme such as Flexicar (www.flexicar.com.au/) or GoGet (www.goget.com.au/) instead of owning a car. You save time and money by avoiding petrol, insurance, registration, cleaning and servicing, and use new, clean vehicles when and where you need them.

A note on air travel

A major strength of Monash University is our global presence, however the air travel associated with operating an international organisation contributes substantially to our environmental impact. It is therefore important to explore alternatives such as catching a bus

or train to replace domestic flights, video- or telephone-conferencing, or making the most of each trip by staying longer, meeting with other organisations etc.

7. How else do we use energy?

Offices use energy to power lighting, equipment, air conditioning and transport, but another significant source of energy use is less obvious. 'Embodied energy' refers to "the quantity of energy required to manufacture, and supply to the point of use, a product, material or service".²² This concept represents a more holistic way of evaluating the energy intensity of our lifestyles.

Aluminium, for example, contains a significant amount of embodied energy. For the same energy required to make 1 can from virgin bauxite, 20 cans can be produced from recycled aluminium. Recycling a single can saves enough energy to power a television for 3 hours!²³

To make sound environmental choices, we must therefore consider not only the energy we use directly, but also the energy used indirectly to support our activities and the products we consume.

²² Wikipedia. 2007. 'Embodied energy', Available online at http://en.wikipedia.org/wiki/Embodied_energy, accessed January 2007

²³ Visy. 2007. "Aluminium and steel", Available online at www.visy.com.au/divisions/category_page.aspx?did=1&sid=3&cid=89&scid=93

8. Encouraging change in your office

The first step is examining your own behaviour – it's difficult to convince others to change if you don't walk the talk, and you'll be surprised by the influence you can have simply by demonstrating responsible environmental choices in your own lifestyle.

The following are some tips for encouraging your colleagues to reduce energy, based on research into fostering cultural change within organisations:²⁴

1. **Raise awareness.** Circulate this guide, cut-and-paste sections into newsletters, or pin up on notice boards. Find out where energy is used in your office by conducting a Green Office Environmental Assessment and present these results at a staff meeting. Ensure everyone understands how to save energy and why this is important.
2. **Consider options as a group.** Involve everyone in a discussion on ways to reduce energy in your office. This gives people ownership over solutions, increasing chances of success. Set small, measurable and achievable goals and build on these later.
3. **Display prompts around your office.** Green Office stickers and signage are a great way to remind people to save energy. Place these as close as possible to the action you want to encourage.
4. **Provide incentives for good behaviour.** For example, you might leave a chocolate frog on the desk of everyone who remembers to turn off their lights and computer during staff meetings.

²⁴ For more information, see McKenzie-Mohr, D. 1999. "Fostering Sustainable Behaviour: an introduction to Community-Based Social Marketing", New Society Publishers, British Columbia.

5. **Create social norms.** Encourage respected colleagues and management to demonstrate energy-saving behaviour and highlight their participation to other staff.
6. **Monitor and report on progress.** It is important to track change (and sometimes, the lack thereof!) and provide positive feedback so that everyone can be inspired by progress.

It is important to put yourself in the shoes of your colleagues by anticipating their concerns and highlighting the benefits of change from their perspective – cost savings, less effort etc.

The Green Office Program runs free training sessions which expand on the ideas and techniques presented here. For more information or to become a Green Office Rep for your department, please contact the Green Office Coordinator (see back page).

Speak up!

Each department will face unique challenges to reduce energy consumption. Some areas require constant temperatures for research experiments, while others maintain large computer laboratories or operate energy-intensive machinery – if you have a special issue in your office, we'd like to know about it.

Ultimately, reducing our energy consumption will require everyone to actively participate. So start conversations about energy in your office and if you see opportunities for action, speak up!

How to take action on an environmental issue in your office!

1. Check out the website: www.monash.edu.au/green
2. Ask your Green Office Rep or Environmental Officer:
www.adm.monash.edu.au/ohse/contacts/environmental-officers.html
3. Talk to your supervisor
4. Submit a Green Action request: www.monash.edu.au/green/action/
5. Contact the Environmental Management team at Occupational Health, Safety and Environment on +61 3 9905 1016 or ohsehelpline@adm.monash.edu.au

Occupational Health, Safety and Environment
Building 3A, Clayton Campus, Wellington Road, Clayton

Many thanks to everyone who provided thoughtful comments and invaluable feedback on earlier versions of this guide. Printed on 100% post-consumer recycled content paper using vegetable inks. Last updated May 2007.