GREEN
OFFICE GUIDE

A guide to help you buy
and use environmentally
friendly office equipment

A joint initiative of Commonwealth, State,
and Territory government agencies

Note: A greenhouse coefficient 1 kg CO_2 per kWh and an energy tariff of 15 cents per kWh have generally been used throughout this guide. Different coefficients and tariffs may apply to your circumstances. However, the methods shown can be used with applicable greenhouse factors and tariffs throughout Australia.

Contents

Introduction

You can reduce energy, save money and help the environment by buying and using "green" office equipment.

Many people don't realise that operating office equipment can cost much more than the equipment costs them in the first place. For example, a photocopier that costs you $4,000 to buy, that is left on continuously for seven years over its two-million copies life, may consume $1,500 of electricity, $24,000 of paper and $15,000 of toner. The greenhouse gas emissions from supplying energy from power stations and manufacturing and disposing of the paper you use could exceed 80 tonnes of carbon dioxide, which is equivalent to more than the total greenhouse gas emissions of a typical Australian home over that seven-year period.

Increasingly, leading edge organisations are considering operating costs as well as environmental impacts when they buy their office equipment. For example, they understand that if you buy an energy-efficient photocopier designed to work well with recycled paper and refilled toner cartridges, copy double-sided whenever you can, set up an effective paper recycling system, and set the photocopier to powersave when you're not using it, over its seven-year life you may:

- reduce the electricity you use by up to 80%
- save up to 80% on your electricity bill
- halve your paper and toner bills
- reduce greenhouse gas emissions from electricity, paper and toner by 75%
- leave 50 trees in the ground which would otherwise have been chopped down to make paper
- involve your staff in doing something for the environment
- increase productivity through improved staff morale
- enhance your company's profits.

Paper reduction and recycling schemes can reduce the costs and environmental impacts of paper use by 75–95%. To achieve such spectacular savings, effective staff training and feedback on performance are essential.

The *Green Office Guide* helps you buy environmentally friendly office equipment and use it to reduce your operating and environmental costs, including greenhouse gas emissions. This Guide has been produced as part of the National Appliance and Equipment Energy Efficiency Program supported by the Commonwealth, State and Territory governments.

Why go green?

Making your office an energy-efficient, environmentally friendly place reduces air and water pollution, keeps more trees in the ground and involves your staff in doing something good for the environment.

There are some very good reasons for making your office an energy-efficient, environmentally friendly place.

First, buying and using energy-efficient equipment saves you money. It can provide enormous savings in electricity use alone, saving you up to $180 per 1,000 kilowatt-hours of energy and cutting up to 80% off your electricity bill. It can also cut 20–30% off your air-conditioning bill because you are reducing the amount of heat that your equipment generates and that needs to be cooled.

Paper costs can be almost halved simply by printing double-sided, and you can save $100 on toner and $30 on ink by refilling your printer and toner cartridges. You also save on waste disposal costs because the amount of waste you generate is reduced.

Second, the environmental benefits of using energy-efficient equipment are tremendous. By reducing the electricity you use you are reducing air and water pollution from power stations and saving a tonne of greenhouse gas for each 1,000 kilowatt-hour of electricity you save.

Refilling, reusing and recycling the materials you use reduces the amount of waste and pollution you generate. In addition, making equipment from recycled metals, plastics and other materials saves at least two kilograms of greenhouse gas per kilogram of product.

Using recycled paper saves trees. Every 100 reams of recycled office paper that is printed double-sided saves two trees, more than a tonne of greenhouse gas and almost a cubic metre of landfill space compared to 100 reams of paper that is not recycled or printed double-sided.

Third, making your office a "green" one will involve your staff in doing something for the environment. Knowing that their actions can really make a difference will enhance a natural motivation to act in an environmentally responsible way. Since motivated staff are productive staff, you can expect an increase in productivity. Since most office-based workplaces spend about 100 times as much on wages as they do on energy, small increases in staff productivity can have major impacts on profitability and your company's bottom line.

Figure 1 Money saved by reducing electricity consumption by 1000 kwh
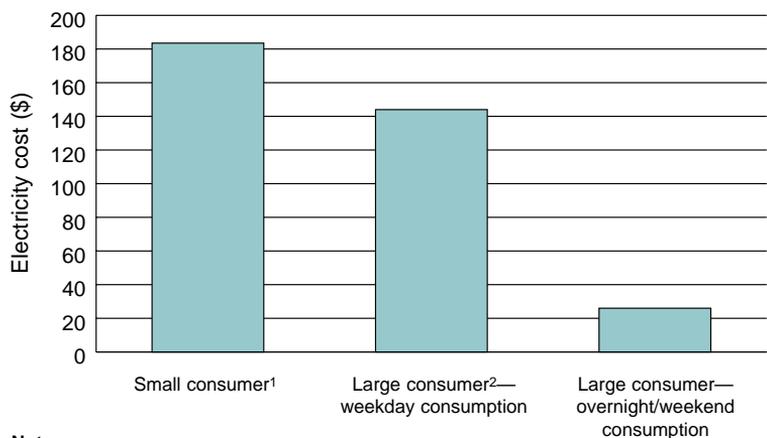
Notes

1. Citipower, Tariff: General Purpose E, July 2000

2. Citipower, Tariff: Contract Demand Time of Use L, July 2000 (assuming summer peak demand of 4.5 megawatts, average peak load of 3 megawatts and off-peak load of 1 megawatt)

Myths and realities

People often use office equipment in what they believe is a cost-effective and environmentally friendly 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 polluting, dollar- and energy-wasting myths and the realities behind them.

Myth When equipment is turned on, or powers up from sleep or suspend modes, there is often 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 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 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. If you want to save energy you can set your screen saver to 'none' or 'blank screen.'

Myth Turning off computers crashes 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. Today some manufacturers specify a life of 40,000 power cycles for their hard drives. That is equivalent to 30 stop/start cycles for each working day over five years.

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.

Myth The Windows NT operating system prevents you from using power management features.

Reality Windows 95 was the first Microsoft operating system to fully support power management. For machines running on many versions of Windows NT, power management can only be achieved by changing the settings in the BIOS (basic input/output system). However, Version 5 of Windows NT has extensive and more easily enabled power management features.

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.

Myth Printing double-sided and/or using recycled paper causes photocopiers to jam and makes you use more paper.

Reality Many of us have had these experiences certainly, but they are quite avoidable in modern equipment. When buying new photocopiers and printers, ensure that manufacturers and suppliers are prepared to guarantee effective performance in these areas. Some copier manufacturers (e.g. Canon and Fuji Xerox) will specify the brands of recycled paper they approve.

Myth Refilled toner or ink cartridges leak everywhere and make an incredible mess.

Reality As with recycled paper, this problem is avoidable and manufacturers and suppliers should be prepared to guarantee effective performance.

> Screen savers save energy—right? Wrong! Don't be fooled by some of the more common myths surrounding energy efficiency.

ENERGY STAR office equipment

Manufacturers of office equipment are responding to consumer desire for more environmentally sound products. An important driving force behind this trend has been the ENERGY STAR® program which was begun by the United States Environment Protection Agency (USEPA) in 1992. Under the program, manufacturers can display the ENERGY STAR logo on their equipment if it meets established, ever-tightening energy efficiency standards. The program started with standards for personal computers and monitors and has since expanded to cover photocopiers, printers, fax machines, scanners and devices that can print, fax and scan as well as photocopy, called "multifunction devices."

In Australia, the National Energy Star Program is a cooperative energy efficiency program between the Commonwealth, State and Territory governments which promotes the purchase of ENERGY STAR office equipment. It is funded by the National Appliance and Equipment Energy Efficiency committee and managed by the New South Wales Sustainable Energy Development Authority (SEDA) on behalf of all jurisdictions.

Most commonly, ENERGY STAR features on office equipment involve an ability to power down or sleep when they're not being used and wake up when they're needed. Many products in the marketplace exceed ENERGY STAR requirements, although there is great variation in performance. Interestingly, this often has little to do with price.

As well as looking for the ENERGY STAR logo, it pays to ask questions about the actual power rating in different operating modes, and to shop around for the most efficient equipment.

To work, ENERGY STAR products must have their energy-saving features enabled when they leave the factory. Unfortunately, many suppliers, installers and inhouse IT experts disable them because of concerns they will confuse users or cause network problems, and as a consequence people have used ENERGY STAR equipment without the energy-saving features activated, using more energy whilst earnestly believing they're doing the right thing. You can avoid doing this by asking your equipment installer to show you that the ENERGY STAR features are operating.

ENERGY STAR equipment still uses energy while in sleep mode. You can avoid this by turning off your equipment overnight and when you are away from your desk for a while.

Operating your equipment so that it just meets ENERGY STAR criteria will reduce your electricity consumption by half compared to equipment that is not power-managed. However, you can save a lot more energy by using more efficient equipment and power-managing it by switching it off when you're not using it.

Energy Star equipment can reduce the financial and environmental costs of electricity by reducing your energy use.

Green Power

Green Power gives you the chance to use electricity that comes from environmentally friendly, renewable sources.

You can use the financial gains you have made from enabling ENERGY STAR to benefit the environment even further. Green Power is energy generated from renewable energy sources such as wind, solar, biomass and mini-hydro. Green Power produces less greenhouse gas emissions than conventional energy supplies.

Green Power is available to 96% of Australians. Accredited programs are available in New South Wales, Victoria, Queensland, Western Australia, the ACT and South Australia.

Choosing Green Power provides many benefits to businesses as it:

- is an easy way to reduce greenhouse gas emissions
- demonstrates your business' commitment to the environment
- provides an easily quantifiable measure of reduction in greenhouse gas emissions
- enables the use of the Green Power logo for marketing activities
- assists with meeting environmental reporting requirements
- offers numerous public relations opportunities

For more information about Green Power please see www.greenpower.com.au or talk to your electricity supplier.

Training your staff to use green office equipment

If you introduce power management features into your office without telling your staff about it, you can cause concern that the equipment is not functioning correctly.

On the other hand, you can enhance staff morale and performance by choosing your equipment well and following its installation with training. It is desirable to train staff in its capabilities and explain how they can help protect the environment. It is equally important to train new staff in the environmental systems you introduce.

Require suppliers to demonstrate pre-set power management features after installation in your office. Get them to provide training for all staff in how to operate the pre-set features and program more efficient settings to suit individual and group preferences.

Remember it is important to give staff feedback on their progress and achievements.

Make the most
of your green
office equipment.
Keep these simple
principles in mind
for both economic
and environmental
benefits.
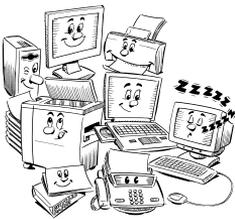
General principles for buying green office equipment

Following are some general principles for buying environmentally friendly office equipment which will ensure that you achieve the full economic and environmental benefits.

ENERGY EFFICIENCY

- Ensure that all equipment conforms at least to ENERGY STAR requirements. Specifying the requirement of ENERGY STAR compliant and enabled office equipment in purchasing policies and procurement contracts ensures that your supplier delivers all products with the ENERGY STAR low-power feature enabled and tested.

- Check power ratings in operating, low power, sleep and off modes so that you can select the most energy-efficient, value-for-money model that meets all your operating requirements. Bear in mind that some equipment can still consume energy after the on/off button has been switched off and the power point is still switched on.

- Obtain data on the time the equipment takes to return to operation when it is switched on or woken up so that you can select equipment that responds quickly. There is no definite correlation between energy use in sleep mode and speed of wake-up.

- Look for the lowest possible time options to move to low power, sleep and off modes. This will save you both energy and money.

PAPER AND OTHER CONSUMABLES

Producing and transporting a sheet of paper to your office usually takes more energy than your printer, fax or photocopier uses to place images on it. The embodied energy of paper is therefore a significant issue, and becomes more so with energy-efficient equipment.

Manufacturing recycled paper can use up to 90% less water and 50% less energy than making it from trees.

For office equipment that uses paper, specify:

- capacity to operate effectively using recycled paper
- capacity for double-sided printing
- plain paper instead of thermal paper for fax machines (thermal paper has higher embodied energy and more chemicals in it than plain paper and may not be accepted in office paper recycling schemes)
- a capacity for photocopiers to scan paper printed on both sides
- long-life printing drums and toner cartridges, which are generally cheaper overall, and less environmentally damaging than shorter-lived alternatives
- a guarantee that the use of remanufactured or refilled toner or ink cartridges will not void warrantees or decrease reliability
- a list of approved remanufacturers or refillers of cartridges.

Bear in mind that the cost of buying imaging consumables can be much more than the cost of buying the paper-imaging equipment. For example, a very popular brand of colour inkjet printer with two bonus ink cartridges can be bought for $250, while replacement cartridges cost $50–60 each. Think of longevity, reusability and refillability of imaging components when buying equipment.

GREEN INDUSTRY/ BUSINESS PRACTICES

• Reusing or recycling materials can significantly reduce the embodied energy in office equipment (see Figure 2 below). Is the manufacturer prepared to take back equipment at the end of its life for reuse or recycling? Does the equipment come apart easily and are the components labelled to make recycling easier?

Some manufacturers are grappling seriously and creatively with "extended producer responsibility," which sees them as broader service providers and not merely suppliers of equipment. For example, Xerox began dismantling photocopiers and recycling parts in 1968. It now reuses up to 75% of the components, and up to 98% of the materials from end-of-life copiers while still offering a three-year guarantee on "new" copiers.

• Ask the manufacturer or supplier about any in-house practices they have instituted to improve their environmental performance. Are these isolated instances or part of an overall environmental improvement plan? Many manufacturers include useful information on their websites.

• Ask the manufacturer or supplier if there are any other environmental features of the product that you haven't asked about. With technology changing so rapidly, you can't think of everything and you may be surprised what you unearth with an open-ended question.

Figure 2 Greenhouse gas emissions from producing a tonne of product from virgin materials or recycled feedstock
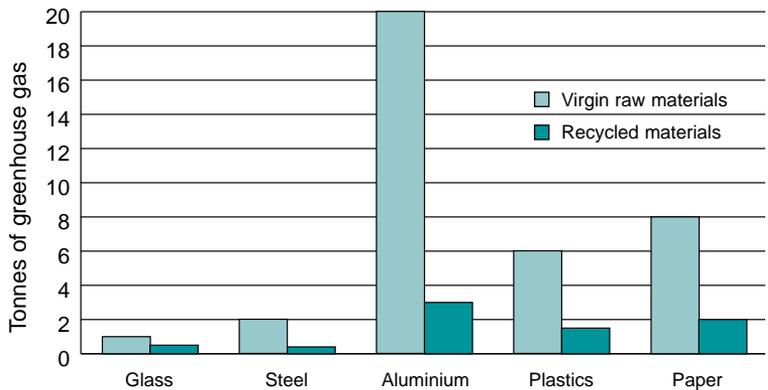
Guidelines for buying and using green office equipment

The advice given in this section expands on the general principles for buying green office equipment given in the previous section and deals with each piece of equipment in detail.

Desktop computers and monitors

When selecting computers and monitors:

- follow the general principles for buying green office equipment set out in the previous section
- consider buying a laptop, since a laptop is much more energy- and materials-efficient than a desktop computer and monitor
- consider buying LCD-type flat screens for desktop computers, as they are more energy- and space-efficient than standard monitors
- if you have a network, buy computers that have been tested with your network software.

Switch off computers and monitors when you're not using them or consider buying a laptop instead.

When using computers and monitors:

- switch them off outside working hours. If some of your staff won't do this, consider installing EMO software to switch their computers off automatically
- you can switch off the monitor if a computer is being used as a server and the monitor is not required
- switch off your computer whenever you are away from your desk for an hour or more or for whatever shorter time you find convenient
- experiment with your power management time settings to find the shortest convenient times that suit you
- think twice before printing electronic documents, particularly drafts and emails
- investigate using floppy, zip and compact disks or tape instead of paper filing systems
- optimise electronic communication methods including email, forms and transactions. This reduces the financial and environmental costs of paper manufacture and supply, imaging, and transporting hard copy documents by mail or courier
- reduce margin settings and type sizes on your computer so that the printer uses less paper. Common default settings for computers are 12 point type and 3.175 cm (1.25 inch) left and right hand margins. Using 11 point type and 2.54 cm (1 inch) left hand margins and 1.27 cm (0.5 inch) right hand margins can increase the amount of information you can fit on a page by up to 27% and save paper. This still allows ample margins for binding and hardcopy filing.

Desktop computers generally draw about 40 to 50 watts when in use. Monitors usually use 50 to 100 watts, with lower values becoming more common. This is lower than the values that are usually shown on product nameplates and data sheets because the maximum likely consumption is usually given and not the average.

The power needed to light up a screen varies according to the area of the screen. That means that moving from a 15-inch to a 17-inch screen at constant efficiency will generally increase your power demand by about 30%. However, because inefficiencies vary markedly between models, some 17-inch screens use less energy that some 15-inch screens

An audit of more than 600 computers and monitors at the University of New South Wales revealed:

- the average computer used 49 watts when fully on, 29 watts when asleep, and 2 watts when switched off. (These numbers reduce to 0 if the equipment is switched off at the power point, rather than just at the off button on the equipment)
- the average monitor used 60 watts when fully on, 6.5 watts in deep sleep, and 1 watt when switched off.

Laptop computers, including their flat liquid crystal display (LCD) screens, are much more energy-efficient— typically 15–25 watts—when fully on. By selecting an efficient laptop computer and operating it efficiently you can reduce your energy use by 98–99% (see Figure 3). You can save energy and give yourself more desktop space too by replacing a standard cathode ray tube (CRT) monitor with an LCD monitor.

To meet ENERGY STAR requirements, computers with a power rating of 200 watts or less must have a sleep mode of no more than 15 watts. Monitors must have a sleep mode of 15 watts or less, and a deep sleep mode of 8 watts or less.

While a significant proportion of ENERGY STAR models only just meet these standards, others beat them by a wide margin. For each of these three sleep modes the USEPA Product Database* lists models powering down to almost zero watts.

Figure 4 shows you the range of sleep mode performance for ENERGY STAR-compliant computers and monitors. The wide variation confirms the importance of buying best practice products in preference to those that just meet ENERGY STAR requirements.

Additional requirements for ENERGY STAR computers are:

- power management features are to be activated by the manufacturer before shipping—make sure no-one has disabled them en route
- an ability for ENERGY STAR-compliant monitors to power down—they cannot power down by themselves and need a signal from the computer
- an ability to operate in any operating system installed before shipping, unless clearly stated in product literature

EMO

If you can't enable ENERGY STAR on your equipment, an alternative energy-saving software product called Energy Management Option, EMO, is now available. This software can switch off your computer when you're not using it and shut it down at night. It also provides calculations on energy, cost and greenhouse gas emissions savings which are useful details to include in your business's energy audits and reports.

EMO offers significant energy savings for the approximately one-third of all computers which are left on unnecessarily when not in use.

If EMO finds that a computer has been inactive for a certain time, it saves all open data files, closes all applications and the operating system, then switches the computer off. It provides users with positive feedback via an on-screen log-on of the amount of energy, dollars and greenhouse emissions that have been saved during the previous day and since the installation of the software.

EMO was trialled in the Australian Greenhouse Office and has been implemented throughout Environment Australia and the Department of Industry, Science and Resources. It was found to provide a convenient, though not complete, range of power management functions for operating systems such as Windows NT4 which doesn't work well with ENERGY STAR. You still need to take additional action to send your monitor and CPU to sleep, or to power down your hard drive.

EMO can also be used in conjunction with ENERGY STAR to ensure that computers and monitors are off after hours, rather than just sleeping.

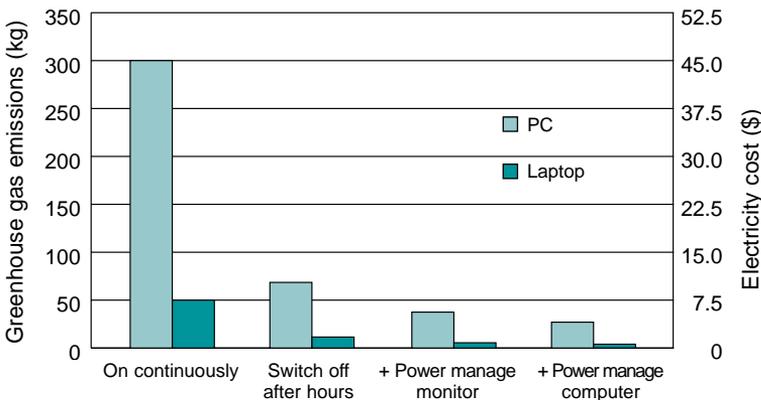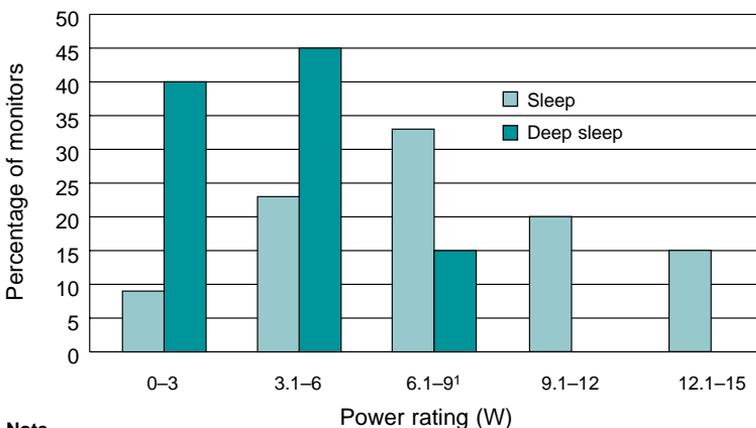**Figure 3** Annual greenhouse gas emissions and electricity consumption for PCs and laptops

Figure 4 Sleep mode ratings for monitors on the ENERGY STAR database, 1 July 2000

Note

1. 6.1–8 watts for deep sleep mode

* http://www.epa.gov/appdstar/estar/products.html

Photocopiers

When selecting a photocopier, follow the general principles for buying green office equipment set out in the general principles for buying green office equipment section.

- If you are looking for a copier with accessories, make sure that the quoted power rating in lower power mode includes the power consumed by accessories.

- Look for a copier with an "energy save" button in addition to programmable power management features so that users can put the machine into low power mode as soon as they finish copying.

- Choose a copier with a seven-day clock that allows you to program it to turn off when it isn't needed at the end of each work day and on weekends.

- Unless you are buying a small format photocopier, choose one with the capacity to reduce from A3 to A4.

- For multi-user copiers, consider a second paper bin to feed paper that is already printed on one side.

- Select a photocopier with a high recycled material content and that makes use of recycled components.

When using photocopiers:

- make sure you need a printed copy before you photocopy the document

- turn the photocopier off at the power point at the end of the working day and during periods of inactivity. If the machine is in a very humid environment, this may not work well. In that case, the options are to turn the photocopier off at the machine and not the power point, or turn the heating elements back on for some time before copying at the start of the working day

- set low power and off mode default times to the lowest available settings that suit your purposes

- copy double-sided whenever you can

- use paper with the highest recycled content the manufacturer or supplier will recommend for your printer

- use recycled or refilled toner and ink cartridges

- where possible communicate by email instead of paper.

The ENERGY STAR guidelines for standard-sized photocopiers (those handling A4 and A3 paper) are summarised in Table 1. There are separate criteria for large format photocopiers (A2 or larger).

Table 1 ENERGY STAR criteria for standard-sized photocopiers

Copier speed (copies per minute = cpm)	Low-power mode (watts)	Low-power default time (minutes)	Maximum recovery time of 30 seconds	Off mode* (watts)	Off mode default time (minutes)
0 < cpm ≤ 20	None	Not applicable	Not applicable	≤ 5	≤ 30
20 < cpm ≤ 44	3.85 x cpm + 5	15	Yes	≤ 15	≤ 60
44 ≤ cpm	3.85 x cpm + 5	15	Recommended	≤ 20	≤ 90

* This is when the copier has been turned off via the auto-off feature or physically switched off at the machine but not at the power point.

ENERGY USED BY PHOTOCOPIERS

The major part of photocopier energy use is the heating of components which fuse toner to paper. These components are often kept hot when the machine is idle, so power consumption can stay high unless you switch the machine off or power-manage it.

These factors affect copier energy use:

- warm-up time. If the machine warms up quickly, it can be switched off when you're not using it. The best office copiers warm up in less than 10 seconds, while small home office machines warm up even more quickly

- consumption while copying. Electricity consumption while copying varies from a few hundred watts to several kilowatts, generating from a quarter to more than three kilograms of greenhouse gas and costing from four to 45 cents per hour of continuous copying. Each time you start photocopying, the machine uses extra energy to get ready to operate. You can save energy by "batch copying," which involves saving up your copying tasks and doing them in one batch

- standby consumption when switched on but not copying. Keeping the operating components of your photocopier warm or "on standby" ready for immediate copying uses from 15 to 400 watts of electricity. This generates a kilogram of greenhouse gas every 2.5 to 65 hours and costs from 0.2 to 6 cents per hour. It is far better to power-manage your machine

- power management features. Some older models of photocopiers have "energy save" buttons which are supposed to reduce energy consumption while on standby but which in reality save little or no energy. However, the newer ENERGY STAR photocopiers include an efficient energy save button in their range of power management features

- energy consumption when switched off. Some copiers have small electric elements of up to 50 watts that operate continuously unless the photocopier is switched off at the power point. These are only needed in humid environments

- energy consumption of accessories. Document feeders and collators may consume a lot of energy if they don't power down with the rest of the machine. You can see in Figure 5 the greenhouse gas emissions from photocopiers operating under different power management regimes.

Figure 5 Annual greenhouse gas emissions and electricity consumption from photocopiers (50 cpm, 1,000 copies/day)
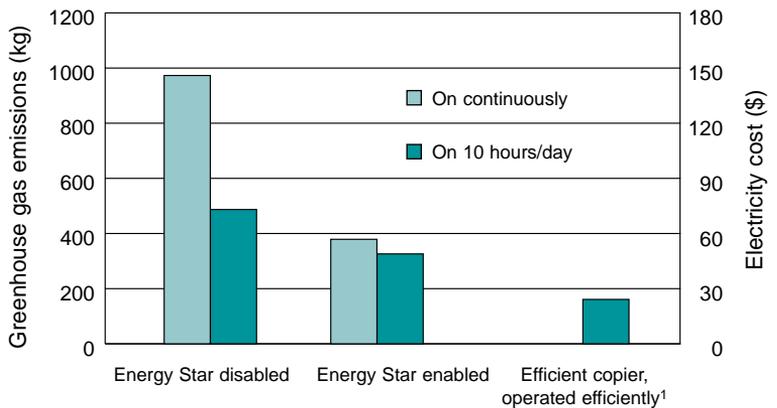
Note

1. An efficient copier, operated efficiently would not be left on continuously

PAPER USED BY PHOTOCOPIERS

Paper (including toner) is the biggest cost of a photocopier and has the most environmental impact. Strategies which reduce the need for multiple copies of documents can save energy, money and the environment. These include options such as:

- reducing the number of printed copies you make by communicating through circulation lists, notice boards and email and storing the information communicated on floppy, zip and compact disks

- reducing the number of sheets needed to print a given amount of information by using double-sided copying, reducing two pages to fit on one sheet, and loading paper already printed on one side into an extra paper supply bin.

MATERIALS USED BY PHOTOCOPIERS

Greenhouse gas emissions from the energy used to manufacture a standard floor-standing photocopier from raw materials are about 0.5 tonne. This is a tenth to a quarter of the greenhouse emissions from energy use during the copier's lifetime, and 1–3% of those from the paper used. Reuse and recycling of components and materials is becoming more widely practised by photocopier manufacturers and can save more than half of this impact.

Whilst prolonging your photocopier's life will save the materials needed to manufacture a new machine, if you replace it with a machine that substantially reduces paper and energy use you will be saving the environment by reducing greenhouse gas emissions.

Printers

When selecting a printer, follow the general principles for buying green office equipment set out in the general principles for buying green office equipment section.

Ensure the printer has toner- or ink-saving modes such as draft or "econosave" and ask to see documentation of the amount of toner and ink saved in this mode.

Choose a printer that can print double-sided and consider installing a third paper bin for networked printers so that you can print drafts and internal documents on paper that is already printed on one side.

For small-volume printers that don't have the ability to print double-sided, make sure odd and even pages can be printed easily.

Before you print, think about whether you really need a printed copy. Whenever possible, communicate by email instead. For those documents you do need to print, here are some energy and paper saving tips:

• turn off the printer when you're not using it and at the end of the working day (make sure no-one else wants to use it first, particularly if it's part of a network)
• set sleep mode default times to the lowest available setting that is convenient for your needs
• print double-sided whenever you can
• use the Print Preview function to check layout and style instead of printing
• adjust your margins and type size to fit more on the page
• use paper with the highest recycled content the manufacturer or supplier recommends for your printer
• use ink and toner saving settings
• recycle or refill toner and ink cartridges.

Table 2 sets out the ENERGY STAR guidelines covering standard desktop printers such as inkjet, laser/LED (light emitting diode), dot matrix and high end colour printers (thermal wax transfer, colour laser and high end laser-quality).
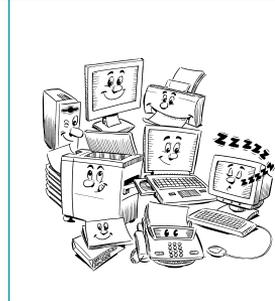
Laser printers use similar technology to photocopiers, so their energy consumption is similar to that of small photocopiers. Inkjet or modern dot matrix printers can provide very high print quality but they are slower than laser printers.

Whilst inkjet printers are often cheaper than laser printers, the cost of buying new ink cartridges may make them more expensive in the long run. You can cut down the cost and their environmental impact by refilling the inkjet cartridges—either through commercial refillers or do-it-yourself kits. Cartridges can often be refilled four or five times while maintaining acceptable print quality.

Many companies now recycle laser cartridges too. Long-life cartridges that are usually cheaper to use per page are also available. Some of the newer laser printers, such as the Kyocera Ecosys ones, have a long-lasting print drum and require only toner refills. This reduces both environmental impacts and costs.

Table 2 ENERGY STAR requirements for printers after 31 October 2000

Rated printer speed (pages per minute)	Sleep mode (watts)	Default time to sleep mode (minutes)
0 < ppm ≤ 10	≤10	≤ 5
10 < ppm ≤ 20	≤ 20	≤ 15
20 < ppm ≤ 30	≤ 30	≤ 30
30 < ppm ≤ 44	≤ 40	≤ 60
44 < ppm	≤ 75	≤ 60

The ENERGY STAR program has resulted in much more efficient laser printers being developed. These can rival the better inkjet printers in sleep mode, but they still use more energy while printing.

Some examples of the greenhouse gas emissions from the electricity used by printers operating under different power management regimes are given in Figure 6.

Figure 6 Annual electricity-based greenhouse gas emissions and electricity consumption from printers printing 200 pages a day
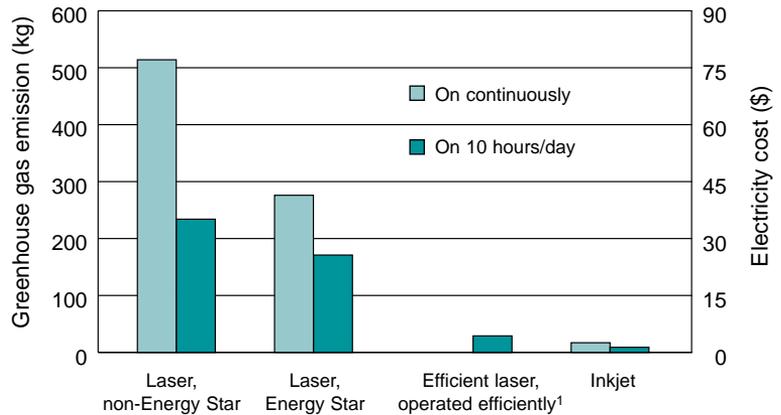
Note

1. An efficient laser printer operated efficiently would not be left on continuously

Fax machines

Fax machines are mostly inactive so it is important to choose one with a low standby energy rating.

When selecting fax machines, follow the general principles for buying green office equipment set out in the general principles for buying green office equipment section.

Buy a plain paper machine. If it's a laser or LED machine, make sure your warranty covers reusing paper. Otherwise, choose an inkjet machine.

For fax/printer machines, make sure that the model you choose is more energy-efficient than running two separate machines would be.

Ensure the fax machine has toner- or ink-saving modes such as draft or "econosave" and ask for documentation of the amount of toner and ink saved in these modes.

Before faxing something, think about whether you can communicate using email instead. If you can't, here are some energy and paper saving tips:

- if you have many fax machines, divert calls to a few units after hours and turn the rest off
- set sleep mode default times to the lowest available setting
- fill the paper bin/cartridge with paper that is already printed on one side
- adjust your margins and type size to fit more on the page
- use ink and toner saving settings
- recycle and refill toner and ink cartridges.

Before the introduction of the ENERGY STAR program very few fax machines had a sleep mode. However, nowadays most of them do. From 1 November 2000 ENERGY STAR requirements for fax machines are the same as for printers (see Table 2 on page 14).

Over the past few years, fax and printing technologies have moved much closer together to the point where there are now many combined fax/printers on the market. Therefore, many of the guidelines for buying environmentally friendly printers apply to fax machines too.

Because most fax machines send and receive faxes for only a small proportion of their operating time, the energy they use in standby and sleep modes is important. There are models available that consume from 0.5 to two watts in sleep mode, while others just meet the ENERGY STAR requirements. You may be able to find a fax/printer with lower energy consumption than two separate machines.

Most people still leave their fax machines on all the time. However, if you rarely receive faxes outside working hours, consider switching them off after hours to save energy. In the case of larger offices with many fax machines, energy can be saved by turning off some machines after hours and diverting calls to one or a few machines.

Thermal paper can cost about two and a half times as much as plain paper, and plain paper already printed on one side is often reused in fax machines. For laser and LED machines, you will need to check that reusing paper is covered by the manufacturer's warranty. Whilst using a 100 metre roll of thermal paper a week would cost more than $3,000 over five years, reusing plain paper over the same period would cost only $400. Another problem with thermal faxes is that the image fades over time and faxes often have to be photocopied onto plain paper anyway.

In many offices, faxes are transmitted with a separate cover sheet and individual transmission or status reports are printed. This increases the amount of paper used by one-third. You can avoid the problem by using stick-on labels or rubber stamps for the front pages of faxes and writing in the name of the recipient, the date and the number of pages being sent.

Fax modems and electronic fax devices connected to computers or printers can be very energy-efficient but if they require a computer or printer to be left on when they would otherwise be switched off, they can lead to significant energy use. Many devices have adequate buffer memory to store incoming faxes until the printer is next turned on.

For most purposes, however, email is likely to be the cheapest, convenient and environmentally sound option available.

In fact, for many businesses fax traffic has dropped off markedly with the widespread use of email.

Examples of the electricity-based greenhouse gas emissions from fax machines operating under different power management regimes are shown in Figure 7.

Figure 7 Annual electricity-based greenhouse gas emissions and electricity consumption from fax machines
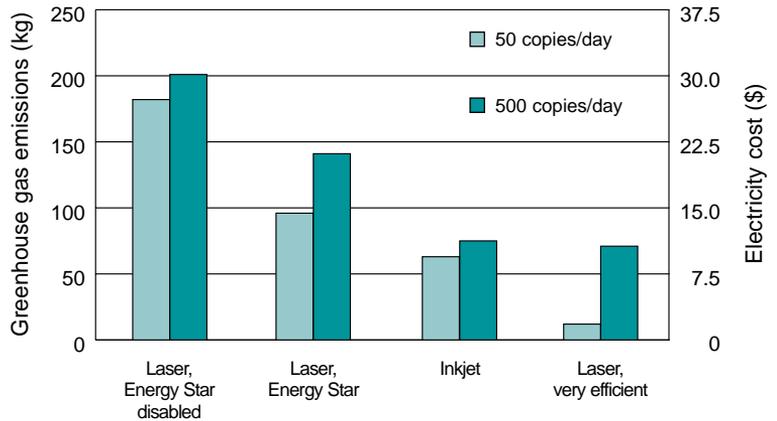
Scanners

In most offices scanners are used only occasionally. Switch yours off for most of the time.

When you buy a scanner, follow the general principles for buying green office equipment.

Only turn your scanner on when you want to use it.

To meet ENERGY STAR requirements scanners must be able to enter a sleep mode of 12 watts or less in no more than 15 minutes. There are some scanners on the market with a power rating for sleep mode of about 3 watts, but most are three to four times that amount.

Generally, high resolution scanners use more energy in sleep mode than lower quality ones. However, there are a few high resolution machines at the energy-efficient end of the scale. Consult the manufacturer regarding the 'sleep mode' energy rating.

While relatively rare a few years ago, scanners are now one of the fastest growing segments of the office equipment market and are commonly included in home/small office computing packages.

In most offices scanners are only used occasionally. They can therefore be switched off for most of the time. Networked scanners can be switched off outside working hours and during office hours if they are not used very much.

Multifunction devices (MFDs)

Multifunction devices (MFDs) are machines which print and fax as well as copy.

When selecting MFDs:

- follow the general principles for buying green office equipment set out in the general principles for buying green office equipment section
- evaluate the likely recurrent financial and environmental impact of the MFD compared to individual pieces of equipment.

When using MFDs, consider the issues raised for single pieces of equipment in the earlier sections of this booklet.

You can see the ENERGY STAR requirements for MFDs in Table 3.

Weigh up the advantages of multifunction devices over single pieces of equipment. Your decision on what to buy will depend on how much you use them.

Table 3 ENERGY STAR requirements for multifunction devices

Multifunction device speed (images per minute = ipm)	Low-power mode (watts)	Recovery time 30 seconds	Sleep mode (watts)	Sleep mode default	Automatic duplex mode time (minutes)
0 < ipm ≤ 10	Not applicable	Not applicable	≤ 15	≤ 15	No
10 < ipm ≤ 20	Not applicable	Not applicable	≤ 70	≤ 30	No
20 < ipm ≤ 44	3.85 x ipm + 50	Yes	≤ 80	≤ 60	Optimal
44 < ipm ≤ 100	3.85 x ipm + 50	Recommended	≤ 95	≤ 90	Optimal
100 < ipm	3.85 x ipm + 50	Recommended	≤ 105	≤ 120	Optimal

The advantages of MFDs include systems integration, ease of use, office space savings and often significantly lower capital costs compared to buying several equipment items performing the same range of functions. Choosing an MFD over individual pieces of equipment can also create significant savings in embodied energy, materials and environmental impacts.

Comparing the recurrent financial and environmental performance of MFDs and single function machines can be quite complicated. For example, whilst the lowest power sleep mode for a copier/printer/fax/scanner listed on the ENERGY STAR Product Database is 45 watts, it is possible to find single function machines which sleep at about a quarter of that.

If you use any of the four functions relatively infrequently, it may cost you more because you can't turn that function off while the machine is on for other functions. This may be most significant if your need for photocopying is light. There could also be extra costs involved if you need to keep the fax on after hours, because the whole machine has to be left on.

Given the recent history of design improvements in the very best office equipment, it is likely that more efficient MFDs will become available.

Bonus savings from air-conditioning

Using energy-efficient equipment will give you bonus savings on your air-conditioning bills because you are generating less heat that has to be cooled.

In medium to large offices, the number of people and presence of equipment and lights all generate extra heat. This adds to the load the cooling cycle of air-conditioning systems has to deal with. That's why even in Australia's coolest cities it takes more energy to cool office blocks over a year than it does to heat them.

Estimating the air-conditioning energy savings due to efficient office equipment is complicated by two factors. Firstly, air-conditioners typically produce two to three units of cooling for every unit of electricity consumed (that is, their coefficient of performance or "COP" is between two and three). So, to remove a kilowatt-hour of heat energy requires between a third and a half a kilowatt-hour of electrical energy. Secondly, in cold weather the heat from office equipment may help heat the building, saving on heating from other sources. However, this is a relatively minor effect.

Once these factors are accounted for, air-conditioning savings from using more efficient office equipment usually bring an extra 20–30% saving in energy costs and greenhouse gas emissions. That is, if an efficient copier saves 1,000 kilowatt hours a year (saving about $150 and generating a tonne less greenhouse gas), additional savings will be up to $45 on air-conditioning costs and 300 kg of greenhouse gas emissions.

Older office buildings were not designed to cope with the high density of office equipment they now have to deal with. The result is that many buildings cannot be cooled enough to deliver comfortable working conditions throughout the year. This leads to either discomfort and lowering of staff morale and productivity, or very costly replacement or augmentation of air-conditioning systems, since a kilowatt of air-conditioning capacity typically costs about $250.

Currently, most office buildings are designed assuming a peak heating load from office equipment of 15 watts per square metre. In other words, they are actually designed with inefficient energy use in mind.

A new, more environmentally friendly approach has been taken in the design of the 60 L Green Building in Melbourne, a four-storey commercial development to be built in late 2000. This innovative building, which will incorporate the new national headquarters of the Australian Conservation Foundation, has been designed with energy-efficient office equipment and lighting in mind.

For about a quarter of the year, the building will be ventilated naturally and people will be able to open their windows if they wish. During this time there will be no heating or cooling at all, creating a 75% reduction in cooling energy. The cooling plant, which will be used in hot weather, will be 20% smaller than conventional plants and will save an estimated $100,000 in capital costs.

Overall, it is anticipated that the total annual energy bill for this building will be about 70% less than for a typical commercial building of the same size—a saving of about $50,000 a year.

Building owners and tenants can be assisted to reduce energy use, energy costs and greenhouse gas emissions through the Building Greenhouse Rating scheme.

This scheme benchmarks a building's greenhouse impact on a star scale of one to five, one being the most polluting and five the least.

The star rating is based on energy consumption and greenhouse gas emissions resulting from energy consumed by your building or tenancy.

For more information on the Building Greenhouse Rating scheme visit the website, www.abgr.com.au.

Case studies

In the following scenarios for commercial and home offices, computers and monitors comprise 85–95% of energy costs, with printers and copiers next most significant, at 3–6% of energy costs. This highlights the importance of careful selection and management of computers and monitors.

COMMERCIAL OFFICE

This case study considers a typical office of 200 people using the following equipment:

- 200 personal desktop computers
- 20 networked laser printers
- five fax machines
- five scanners
- five photocopiers.

Figure 8 Annual greenhouse gas emissions from office equipment for a typical commercial office.
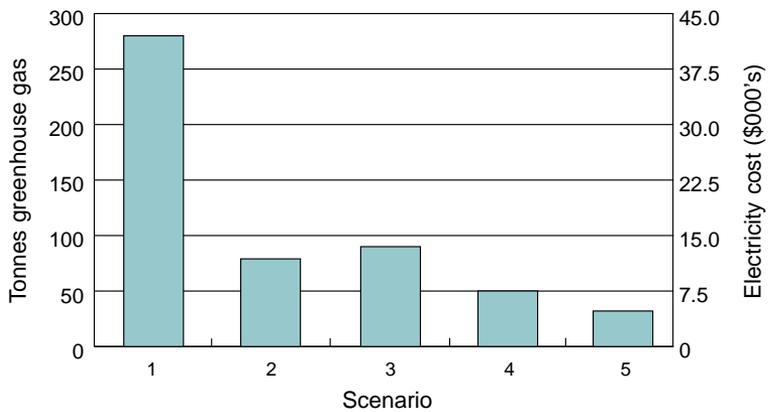
Note: Citipower, Tariff: Contract Demand Time of Use L, July 2000

	Pattern of use	ENERGY STAR	Electricity (annual)	Greenhouse gases (annual)
Scenario 1	Equipment left on all the time	ENERGY STAR features disabled	$42,000	280 tonnes
Scenario 2	Equipment switched off at night (except 10 computers acting as servers and 1 fax)	ENERGY STAR features disabled	$12,000	80 tonnes
Scenario 3	Equipment left on all the time	ENERGY STAR enabled (at default settings)	$13,500	90 tonnes
Scenario 4	Equipment switched off at night (except 10 computers acting as servers and 1 fax)	ENERGY STAR enabled (at default settings)	$8,000	70 tonnes
Scenario 5	Equipment switched off at night (except 10 computers acting as servers and 1 fax)	ENERGY STAR enabled (at user defined settings)	$5,000	30 tonnes

HOME OFFICE

A home office has a personal computer, fax machine, inkjet printer, scanner and small photocopier.

If this equipment is left on continuously, it will generate annual greenhouse gas emissions of around 1.8 tonnes, with an electricity bill of around $220. Switching off the equipment outside working hours will cut greenhouse gas emissions by more than 60% and save $135 each year on energy bills.

Selecting the most efficient equipment available, and switching it on only when needed, as well as enabling the ENERGY STAR features will cut electricity costs and impacts to less than 20% of the cost of equipment left on all the time.

If the office used a laptop computer and either the best available printer, fax, scanner and copier, or a small combination printer/fax/copier/scanner and enabled the ENERGY STAR features, greenhouse gas emissions would fall to around 150 kilograms of greenhouse gas each year, and annual energy costs would fall to under $20, which is more than a 90% reduction.

Based on paper use of 80 sheets per day, using ordinary office paper would cost around $240 each year. Efficient paper use, reuse of paper printed on one side, purchase of premium recycled paper and recycling of all paper no longer needed could cut this by 70%, saving around $170 on annual paper costs. Annual greenhouse gas emissions from paper use would be reduced from around 700 kilograms to less than 50 kilograms.

Further information

The following websites provide useful information on equipment energy efficiency, ENERGY STAR and environmentally sound office practices.

Australian National ENERGY STAR:
http://www.energystar.gov.au

US-EPA ENERGY STAR:
http://www.epa.gov/appdstar/

Energy Smart:
http://energysmart.com.au

Australian Greenhouse Office:
http://www.greenhouse.gov.au

NSW Sustainable Energy Development Authority (SEDA):
http://www.seda.nsw.gov.au

NSW Ministry of Energy and Utilities
http://www.doe.nsw.gov.au

Sustainable Energy Authority Victoria (SEAV):
http://www.seav.vic.gov.au

Western Australia Office of Energy:
http://www.energy.wa.gov.au

South Australian Office of Energy Policy:
http://www.pir.sa.gov.au

Queensland Department of Mines and Energy:
http://www.dme.qld.gov.au

Environment Australia:
http://www.ea.gov.au

Appliance Energy Rating:
http://www.energyrating.gov.au

Green Power:
http://www.greenpower.com.au/

New Zealand Energy Efficiency and Conservation Authority:
http://www.energywise.co.nz

Energy Efficiency and Renewable Energy Network (US Department of Energy):
http://www.eren.doe.gov

Lawrence Berkeley Laboratory:
http://eande.lbl.gov

American Council for an Energy-Efficient Economy:
http://www.aceee.org

Rocky Mountain Institute:
http://www.rmi.org

The following publications may be of particular interest.

Mercer, K; Kasula, V; and Nilson, R, Does Power Cycling a Desktop Computer Harm It?: http://www.energywise.co.nz

Nordman, B; Piette, M; Kinney, K; and Webber, C (1997),User Guide to Power Management in PCs and Monitors, January: http://www.eande.lbl.gov/EAP/BEA/LBLReports/39466

McQuinlan, P (1997), Implementing ENERGY STAR Features on Network Computer Equipment, June: http://www.energywise.co.nz

University of New South Wales Green Office Program (2000), Personal Computers and Energy Conservation—the Case for Switching Off.

University of New South Wales Green Office Program (2000), UNSW Library Building Office Equipment Energy Audit, April.

Fuji Xerox Australia Pty Ltd (1997), Down-to-earth officecare

Pickin, J (1996), The Environmental Impacts of Paper-Consuming Office Technologies in Australia, Australian Conservation Foundation, Fitzroy.

Smith, L, Ledbetter, M and Dandridge, C: (1996) Guide to Energy-Efficient Office Equipment, American Council for an Energy-Efficient Economy, Berkeley: http://www.aceee.org/pubs/o2.htm