Tenant Energy Management Handbook

Your guide to saving energy and money in the workplace

BUILDING GREENHOUSE RATING

www.abgr.com.au

Acknowledgments

Thanks to the creativity, knowledge and enthusiasm of many people, tenants in commercial offices now have access to state of the art advice on reducing and managing energy consumption and reducing greenhouse emissions in the workplace. We would like to acknowledge the efforts of a number of people. Firstly, special thanks to Chris Luscombe, Group Operations Manager of The Mirvac Group for his original suggestion which turned into the Tenant Energy Management Handbook. Nicola Saltman who is now Green Power Project Officer at the Sustainable Energy Development Authority took a vague concept and a title and turned it into a substantial publication. Nicola's work received rave reviews from the people who kindly evaluated it as a draft. Our very special thanks to Nicola for her dedication to delivering a user-friendly Handbook covering the energy management and greenhouse field for tenants in small and large offices across the country.

We also thank the following people who made invaluable contributions to the final publication:

Cathy Gray, of Catherine Gray Editorial Services

John Eleftheriou and Liz Mahony from Metro Graphics Group Pty Ltd

Alan Pears of Sustainable Solutions

Roger Hurley of Enginuity Energy Services

Paul Rogers of Sustainable Energy Authority (previously Energy Efficiency Victoria)

Lloyd Woodford of Australian Tenants Advocates

Jake Bugden and Leyden Deer of the Department of Industry, Science and Resources

The Australian Greenhouse Office

Leen van Bree of Addicoat Hogarth Wilson Pty Ltd

Ray Rudkin of Energy Conservation Systems (ECS)

Robert Turner of the Australasian Energy Performance Contracting Association (AEPCA)

Daniel Cooper and Ignatius Verbeek of the Sustainable Energy Development Authority.

Again, thank you all for your professionalism and commitment to our project. Your efforts have helped turn the original suggestion into a resource that works with the Building Greenhouse Rating scheme and empowers tenants to reduce and manage their energy costs as well as cut their greenhouse gas emissions.

The Sustainable Energy Development Authority has been very pleased to work with our Partners on this Project - the Energy Efficiency Best Practice Program of the Department of Industry, Science and Resources and the Property Council of Australia. Their participation has added significant value to the project and we thank them for their support and generous contributions.

Sue Salmon, Project Manager,
Sustainable Energy Development Authority

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Sustainable Energy Development Authority
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energy efficiency best practice

The paper used for this handbook is 100% recycled.

ISBN 0-7313-9740-1
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Foreword

The NSW Sustainable Energy Development Authority has developed the Tenant Energy Management Handbook as part of the Building Greenhouse Rating Scheme.

The handbook brings together a wealth of information to help your organisation use energy more efficiently, make corporate savings, and improve greenhouse performance. It has been designed both for people with little experience of saving energy as well as for those with more experience.

Use it as a step-by-step guide to managing energy throughout your business or as an information resource about specific aspects of energy management and the latest energy saving technologies.

Who should use the handbook?

The *Tenant Energy Management Handbook* can be used by **anyone with an interest in promoting energy efficiency** in an organisation.

However, it would be most useful for employees handling financial, accounting, fitout and energy management matters. These key staff members are often in the best position to initiate and implement energy efficiency projects and know how to distribute the information to other staff accordingly. They may include:

- facility managers
- procurement officers/accountants
- energy managers
- leasing managers
- project managers
- business unit managers

About the Building Greenhouse Rating Scheme (BGRS)

The Building Greenhouse Rating Scheme is a voluntary program for office buildings, designed to enable building owners, managers and tenants to get market recognition for superior greenhouse performance. Launched in September 1999 by the NSW Sustainable Energy Development Authority, the scheme is strongly supported by industry including the Property Council of Australia, Master Builders Australia and others.

Star ratings can be awarded for the base building (central services), a tenancy or the whole building. The ratings are based on energy-related greenhouse gas emissions, adjusted to account for climate and how the building is used. *The more stars, the better the performance.*

The rating methodology and a software rating tool are available to help you self-assess at no cost. However, you can only promote the rating if it has been officially reviewed by an accredited assessor and you pay the appropriate fees. The software is available on the website at **www.abgr.com.au**.

Look for the many "Success Stories" that can show you what can be done and how much others have saved.

Contents

About the handbook

The *Tenant Energy Management Handbook* is the first comprehensive guide to effective and profitable energy management for tenants in commercial office buildings. It provides information and resources that will help you improve the greenhouse performance of your premises, while reducing energy use and costs.

The handbook will help you:

- **understand** how your organisation uses energy;
- **assess** the types of technologies and systems you have in place, and discover how their efficiency can be improved;
- **calculate** and quantify energy and greenhouse gas savings using different technologies;
- take advantage of **key opportunities** for improving energy efficiency, such as lease or contract negotiations or renewals, fitouts and new equipment purchases;
- **generate ideas and strategies** to develop an ongoing energy management program.

Finding your way around

The handbook has five main sections:

Section 1: Why take action?

briefly explains the financial and environmental benefits of reducing your organisation's energy consumption.

Section 2: What action can you take?

gives an overview of what you can do, depending where you are in your lease cycle. It also acts as a guide to help you find the information that's relevant to you in sections 3 and 4.

Section 3: Working EnergySmart

includes advice on a range of specific strategies, from involving staff in an energy management program, to negotiating leases or contracts, handling fitouts and new equipment purchases.

Section 4: Energy efficient technology

is a collection of fact sheets on lighting, office equipment, appliances and airconditioning.

Section 5: Tools

offers resources such as useful websites, conversion tables and a glossary. There are also three **energy savings calculators** for comparing costs and presenting a business case for an energy efficiency upgrade or proposed initiative: *Financial savings, Lighting and Buying new equipment*. These calculators are also available on the website (www.abgr.com.au).

The supporting website www.abgr.com.au includes savings calculators and the Building Greenhouse Rating tool, which will help you benchmark and track the greenhouse performance of your tenancy.

Once you achieve a 3-star rating or above, you can even promote your organisation's superior greenhouse and environmental performance by applying for an official Tenancy Greenhouse Rating certificate. See section 3.1

KEY TERMS

To get the most out of this handbook, it helps to understand some key terms, including the units of energy and how they're used. There are also conversion tables and a glossary at the end of the book.

What's a watt?

A watt is the unit of power, or the rate of energy use. A kilowatt (kW) is 1000 watts; a megawatt (MW) is 1,000,000 watts.

What's a kilowatt-hour?

A kilowatt-hour (kWh) is the unit usually used to measure electricity consumption. It's the amount of kilowatts used over a one hour period. For example, a common light bulb uses 60 watts, or 0.06 kilowatts. If it runs for 24 hours a day, 365 days a year, it will run for a total of 8,760 hours. This means the light will consume 525.6 kilowatt-hours (8,760 hours x 0.06 kilowatts) of electricity over the year.

What's a joule?

A joule is the standard unit of energy. Gas consumption is usually measured in megajoules (MJ) which represent 1,000,000 joules, or in gigajoules (GJ) which represent 1,000,000,000 joules. 1 kilowatt-hour = 3.6 megajoules.

What's energy efficiency?

Energy efficiency is about getting the most 'useful work' from every unit of energy consumed, or producing a product using the least amount of energy possible, without compromising quality.

What's the greenhouse effect?

The 'greenhouse effect' refers to a blanket of gases that trap the sun's warmth in the earth's atmosphere. Although a natural phenomenon, recent human activity has meant that the concentration of greenhouse gases, particularly carbon dioxide (CO_2), has increased significantly in the atmosphere. This is likely to have a serious impact on global climate, including an increase in temperature and an increase in the incidence and severity of weather events. Australia has committed to reducing its emissions of greenhouse gases.

What are greenhouse gases?

The main greenhouse gases produced by human activities are carbon dioxide, methane and nitrous oxide. Each gas traps a different amount of heat. A kilogram of methane traps as much heat as 21 kilograms of carbon dioxide, while a kilogram of nitrous oxide traps as much heat as 310 kilograms of carbon dioxide. Throughout this handbook, emissions of the different greenhouse gases are expressed in terms of the equivalent amount of carbon dioxide.

A kilogram of carbon dioxide would fill a large family fridge and a tonne of carbon dioxide would fill an average family home.

KEY TERMS

What's the relationship between greenhouse gases and energy?

Most greenhouse gas emissions come from burning fossil fuels such as coal, oil and gas for energy. The amount of greenhouse gas emitted depends on the type and amount of fuel used. For example, in NSW, generating electricity from coal produces 0.92 kilograms of greenhouse gas per kilowatt-hour, whereas getting the same amount of energy from burning natural gas directly produces only 0.23 kilograms of greenhouse gas. Energy from coal-fired electricity is therefore said to be more 'greenhouse-intensive' than natural gas.

Greenhouse gas emissions from ***electricity*** *vary from state to state because different fuels are used to generate it. Victoria has the highest figure as its electricity comes from burning brown coal — the most greenhouse-intensive energy type. The 60 watt light bulb mentioned above, which runs all year and uses 526 kWh of electricity, generates 484 kilograms of greenhouse gas in NSW and 705 kilograms in Victoria.*

For ***natural gas****, 121 kg CO_2 are produced per gigajoule, or 0.121 kg per megajoule.*

CO_2 emissions from electricity* (kg/kWh or tonnes/MWh)

NSW, ACT	*0.92*
Victoria	*1.34*
Queensland	*1.02*
SA	*0.95*
WA	*1.10*
Tasmania	*0.00*
NT	*0.69*
Australian average	*1.00*

When using the calculators in the handbook or making your own your conversions from electricity use to greenhouse gas emissions, use the appropriate value for carbon dioxide emissions from the table above, according to where your organisation is located.

Converting energy savings to cars off the road

As a 'rule of thumb', annual energy savings have been converted throughout the handbook to a number of cars being taken off the road. This is based on a car travelling on average 15,000 km per year producing on average 4.5 tonnes of carbon dioxide (CO_2).

So saving 12 MWh of electricity in a year, which saves 11 tonnes of CO_2 in NSW (12 x 0.92), equates to taking 2.5 cars off the road (11 divided by 4.5).

* Source: Australian Greenhouse Office (1997). *The Greenhouse Challenge Workbook*

Refer to *Glossary* section 5.5 for further technical terms.

Why take action?

Why take action?

"The property industry long ago recognised that energy conservation in commercial buildings will substantially cut operating costs for both owners and tenants as well as improve the ecology of our cities."

Peter Verwer
Chief Executive, Property Council of Australia.

Section 1: Why take action?

Benefits for your organisation

Improving energy efficiency will:

- **reduce your energy bills**, by as much as 60%, year after year, with savings going directly to your bottom line (several case studies in the handbook show even greater reductions);
- **reduce greenhouse gas emissions** and enable you to report this improved environmental performance – to employees, customers, shareholders and the community.

Energy efficiency in your offices can also help your budget indirectly. It can:

- **reduce maintenance costs** by installing longer-life energy efficient technologies;
- **increase product output** by using the latest high-quality equipment;
- **extend the useful working life of equipment** by controlling running hours and using equipment more wisely;
- **increase staff productivity, morale and loyalty** by creating a comfortable working environment and demonstrating your willingness to take action on an issue of wide community concern;
- **gain market recognition** for the improved environmental performance of your premises. This can give your business a competitive advantage and improve government and other corporate relationships.

Benefits for the environment

Most scientists agree that global warming caused by excessive greenhouse gas emissions - the 'enhanced greenhouse effect' - is one of the most serious environmental problems facing the world today.

Increasing levels of greenhouse gases in the atmosphere as a result of human activity – mostly from burning fossil fuels for energy – are likely to have a serious impact on the global climate. These impacts include increases in temperature, and in the incidence and severity of extreme weather events.

Although Australia contributes just over 1% of total greenhouse gas emissions, our per capita emissions are amongst the highest in the world.

Reducing the consumption of fossil fuel-based energy is critical to reducing our greenhouse gas emissions.

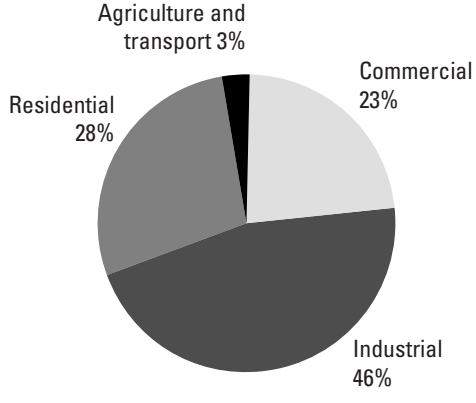
For more information on the greenhouse issue and climate change, see SEDA's website (http://www.seda.nsw.gov.au.)

Commercial office buildings are big energy users

- More than two-thirds of the energy used by commercial office buildings is in the form of electricity - our most greenhouse-intensive energy source. Commercial office buildings account for almost a quarter of the electricity consumed in Australia.
- Operational energy use in the commercial sector generates more than 35 million tonnes of CO_2, and costs business around $4 billion each year.
- Energy use is growing faster in the commercial sector than in any other sector. If growth continues at the same rate, energy-related greenhouse gas emissions from commercial buildings would double to 62 million tonnes by 2010.
- Tenants directly account for almost half the electricity consumption in commercial buildings.

Energy costs are not unavoidable overheads, but rather a controllable expense.

Electricity use in Australia by sector



SUCCESS STORY

Department of Mineral Resources saves $34,000 a year on energy bills

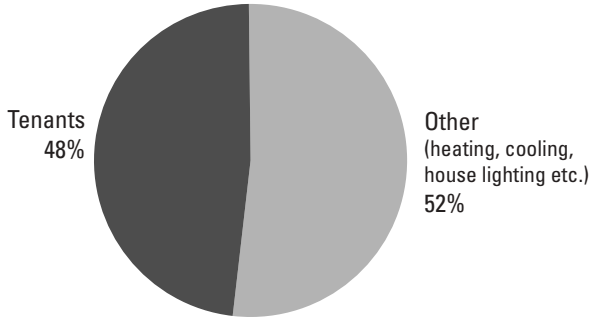
Since 1992, the Department of Mineral Resources in Sydney has introduced a number of energy management strategies in their offices (total 10,216 m^2), including water reduction systems and after-hours lighting timers. As a result, this government department has cut energy costs by almost 15% (from $65/m^2$ to $57.5/m^2$) and is enjoying annual energy savings of $34,000.

Their ongoing program of energy efficiency aims to reduce energy consumption by 25% by 2005. Future projects include refurbishing existing fluorescent lighting and staff awareness campaigns.

How did they do it?

- *Installed zone control lighting system that automatically turns lights off on the weekends and at 7 pm in the evenings. A timer allows cleaning staff or late-night workers to light specific zones for a certain time interval (normally 60-90 mins).*
- *Put lighting movement sensors in all new offices, meeting rooms and work rooms,combined with localised switches in conference rooms.*
- *Installed power factor correction units and water reduction systems.*
- *Installed 'smart meters' that monitor the tenancy's power usage and enable electricity to be bought off the grid according to the best price available at regular time intervals.*
- *Made sure most computers were ENERGY-STAR enabled.*
- *Signed up for 6% Green Power from 1999.*

Typical contributions to energy use in a commercial office building (AGO 1999)



What action can you take?

2 What action can you take?

Energy management is a low-risk tool that can deliver a 'quick win'.

Section 2: What action can you take?

There are many ways to better manage energy use in your offices. These initiatives:

- may require no or little cost;
- can be easy to implement;
- may have other advantages such as improved productivity;
- will provide real long-term benefits for your bottom line and the environment.

As a tenant, your main opportunities for energy savings lie with your office lighting and the power used by equipment such as computers, faxes, copiers and kitchen appliances.

You may have little direct control over 'base building' services provided to you as tenants, such as common area lighting and power, hot water systems or the heating, ventilation, airconditioning (HVAC) system. These are usually centrally metered and included in your rental payments. However, your operations can certainly influence these services and your own improved energy efficiency can provide opportunities for cost savings when renegotiating your lease.

Energy consumption in your office

Energy use is an integral part of being productive and comfortable in your workplace. Every office is different: the relative contribution of lighting, office equipment and other sources will vary depending on the number of people you employ, your equipment requirements, working hours and the overall design of your office space.

Your office energy use can lead to annual costs of up to $35 per square metre and up to 500 kg of greenhouse gas emissions per square metre per year. Supplementary airconditioning can add even more.

Travel associated with your organisation can also contribute significantly to greenhouse gas emissions. Business travel, freight, and employees travelling to and from work — not to mention clients and customers who visit your premises — can all depend heavily on fossil fuels such as petrol for energy.

Making a difference

Step 1: Ways to use energy efficiently

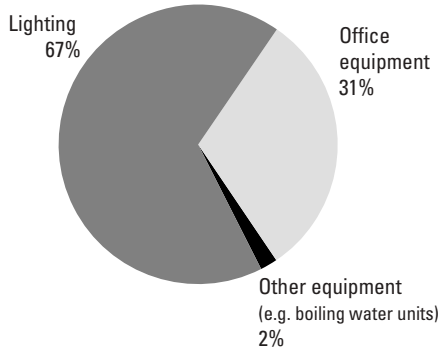
Upgrading equipment and lighting systems to take advantage of efficient modern technology can provide significant benefits. But strategies to improve energy efficiency are not just about new technologies. *How* people use equipment can have at least as much impact on energy consumption as the type of equipment used.

For example, an energy efficient light might use 15–30% less energy than a standard fluorescent. That's certainly an improvement, but remember that it uses no energy at all if it's turned off when not needed. Operating equipment efficiently involves little or no capital cost and provides savings that go straight to your bottom line.

By managing energy effectively in your office, you are also contributing to the improved performance of the 'base building'. For example, installing more flexible lighting controls and fewer lamps in your work space can reduce the heat generated by the lighting system, thereby reducing the load on the airconditioning system and allowing it to run more cheaply. This is known as the 'virtuous cycle' among engineers.

Further, as an energy-conscious tenant, you're in a position to influence the greenhouse performance of office buildings more generally – by, for example, seeking premises where the base building has a Building Greenhouse Rating of three stars or more.

Sample breakdown of tenancy energy use



Step 2: Find out how your office uses energy

You first need to establish whether you are using too much energy in providing the services you require, and whether you are getting good value for the money you spend on energy.

A simple 'walk-through' inspection of your office by an engineer experienced in office energy efficiency can help identify obvious opportunities for improvement. Consult the *Energy Smart Allies Directory* (at energysmartallies.com) for relevant contacts in this field. Organisations which consume a lot of energy may need to conduct a more comprehensive energy audit periodically, to identify where energy is being wasted.

You can also get a sense of the patterns of energy consumption in your office by analysing your bills and checking your meter yourself.

1. Collect your energy bills for at least a year, preferably two.

- Graph energy consumption over time (monthly). Look for patterns and unexplained upward movements.
- Calculate annual consumption per square metre of floor area (floor area should be stated on your lease, or you could estimate it, perhaps by counting ceiling tiles). Compare your energy use with that of a typical office (135 kWh/m^2 + wide variation) and an energy-efficient one (45 kWh/m^2).
- Look at the tariff or contract details to see what components of your energy consumption are most costly (e.g. peak electricity).

2. Use your electricity meter to analyse the pattern of consumption during the day; your electricity supplier can help you find the meter and learn how to read it.

- Over a period of time (say, a week), read the meter at set times each day: start of working hours (say 8 am), start and end of lunchtime (say 12.30 and 2.00 pm), and end of working day (say 6 pm).
- Then calculate the average power use per square metre (in watts/m^2) during working hours, at lunchtime and outside working hours. Use the formula:

  Power use (watts) per square metre
  = (kWh x 1000)/
  (time interval in hours x floor area)

  For example, if consumption is 7.5 kWh over a 1.5 hour lunch period for a 200 m^2 office:

  Power use per square metre
  = (7.5 x 1000)/(1.5 x 200)
  = 25 watts/m^2

  Power use should be somewhat lower at lunchtime and much lower outside working hours than during office hours. If this is not the case, a lot of equipment or lighting is being left on and there is large potential for savings through better equipment management (see section 4).

3. The information from your energy bills can be used to do a Building Greenhouse Rating self-assessment, so you can find out where you stand in terms of greenhouse gas emissions (see section 3.1 *Benchmarking your greenhouse performance)*. It will also be useful when you come to negotiate an electricity supply agreement with an energy retailer (see section 3.6 *Negotiating an energy supply contract)*.

Step 3: Investigate options and implement your program

After reviewing your current office energy use, the next step is to determine the most appropriate energy-saving program, products or systems for your workplace.

The tables on the following pages provide suggestions on key savings opportunities and initiatives, according to six different tenant scenarios. Choose the scenario that best suits your situation and follow the leads to the relevant sections of the handbook.

You could also contact your electricity supplier to see what (free or paid) services they offer to help you cut your electricity bills.

Getting funds approved

Knowing where to save energy is only half the solution. Submitting a good financial case and getting it approved makes the difference.

To get energy efficiency upgrades carried out, the first step is to present a sound financial case to the decision-makers in your organisation to get funds approved. Communicating only the capital cost of an upgrade is like having a winning lottery ticket, but forgetting to collect it. Money spent on upgrades which reduce energy consumption is paid back by savings in energy costs. And the energy savings continue to accrue. Therefore, it is important the decision-makers in your organisation understand the long-term benefits. The best way to communicate this is with quantified information.

By using the resources in this handbook, you will be able to create a financial report and summary which set out project details with capital costs, energy savings, rates of return and greenhouse implications to present to your decision-makers. You can use the template in the Tools *section 5 of this handbook as a guide, or you can go to the* Financial Savings Calculator *on the website to insert the relevant information and print the report out.*

Which scenarios fit your situation?

A **Your lease has some time to run and you don't plan to renew it.**

B **Your lease has some time to run and you plan to stay and renegotiate it.**

C **You're about to renegotiate your lease.**

D **You're looking for new premises.**

E **You're planning to upgrade your office fittings.**

F **You'll be the first tenant in a newly developed building and you're negotiating a lease before the building is completed.**

A Your lease has some time to run and you don't plan to renew it ...

Immediate actions and simple improvements	The handbook shows you how
Working EnergySmart:	
Use the Building Greenhouse Rating tool to self-assess the greenhouse impact of your offices, as a benchmark against which to measure your performance.	3.1 Benchmarking your greenhouse performance
Inform staff of the rating and enlist their help in improving it.	3.2 Your energy management program
Review your lease to ensure you understand the way the building operates (e.g. is there a building management system?). Meet with the building's energy manager to discuss optimising the operation of the building to improve energy efficiency.	3.3 Lease negotiations
Include a Green Power tariff in your energy retail contract and improve your tenancy's greenhouse performance.	3.6 Negotiating an energy supply contract
Produce a Transport Access Guide showing staff and customers how to get to your premises by public transport.	3.8 EnergySmart transport
Energy efficient technology:	
Make the most of your lighting system, e.g. clean light fittings; remove excess lamps where possible. Check what lighting you really need, e.g. remove lamps from overlit areas turn off lights when not needed.	4.1 Lighting
Fit timers to energy-consuming equipment like supplementary airconditioners or hot water units to ensure they're only operating when needed.	4.3 Other equipment 4.4 Supplementary airconditioning
Enable ENERGY STAR on office equipment.	4.2 Office equipment
Further actions and longer-term strategies	
Working EnergySmart:	
Appoint an energy manager and encourage staff participation in energy-saving initiatives. Educate and motivate staff in acting to improve energy efficiency in your workplace.	3.2 Your energy management program
Establish an energy efficient procurement policy – make informed purchasing decisions for energy efficient and environmentally friendly equipment.	3.5 Buying new equipment
When the end of your lease approaches, see Scenario D (and maybe F)	

B Your lease has some time to run and you plan to stay and negotiate it ...

Immediate actions and simple improvements	The handbook shows you how
Working EnergySmart:	
Use the Building Greenhouse Rating tool to self-assess the greenhouse impact of your offices, as a benchmark against which to measure your performance.	3.1 Benchmarking your greenhouse performance
Inform staff of the rating and enlist their help to improve.	3.2 Your energy management program
Review your lease to ensure you understand the way the building operates (e.g. is there a building management system?). Meet with the building's energy manager to discuss optimising the operation of the building to improve energy efficiency.	3.3 Lease negotiations
Include a Green Power tariff in your energy retail contract and improve your tenancy greenhouse performance.	3.6 Negotiating an energy supply contract
Produce a Transport Access Guide showing staff and customers how to get to your premises by public transport.	3.8 EnergySmart transport
Energy efficient technology:	
Make the most of your lighting system, e.g. clean light fittings, remove excess lamps where possible. Check what lighting you really need, e.g. remove lamps from overlit areas, turn off lights when not needed.	4.1 Lighting
Enable ENERGY STAR on office equipment.	4.2 Office equipment
Fit timers to energy-consuming equipment like supplementary airconditioners or hot water units to ensure they're only operating when needed.	4.3 Other equipment 4.4 Supplementary airconditioning
Further actions and longer-term strategies	
Working EnergySmart:	
Appoint an energy manager and encourage staff participation in energy-saving initiatives. Educate and motivate staff in acting to improve energy efficiency in your workplace.	3.2 Your energy management program
Establish an energy efficient procurement policy – make informed purchasing decisions for energy-efficient and environmentally-friendly equipment.	3.5 Buying new equipment
Consider strategies to reduce greenhouse emissions from business, staff and customer travel.	3.8 EnergySmart transport
Energy efficient technology:	
Assess the efficiency of your lighting system, and consider upgrades to more efficient technology where appropriate. Consider self-funding options to achieve upgrades with guaranteed savings.	4.1 Lighting 3.7 Energy Performance Contracting
Consider upgrading office and other equipment.	4.2 Office equipment 4.3 Other equipment 4.4 Supplementary airconditioning
When the end of your lease approaches, see Scenario C (and maybe F).	

C You're about to renegotiate your lease ...

What can you do?	The handbook shows you how
Use your lease negotiations to maximise opportunities for energy-saving in your tenancy.	3.3 Lease negotiations
Discuss opportunities with your landlord to share costs for upgrades (e.g. the lighting system).	3.3 Lease negotiations 4.1 Lighting
Consider lighting upgrades funded by guaranteed future savings.	3.7 Energy Performance Contracting
Consider equipment upgrades or office redesign to maximise energy efficiency.	3.4 Fitouts 4.2, 4.3 Office and Other equipment
Seek a base building performance rating from the landlord. Discuss with your landlord on achieving an agreed level of Base Building Greenhouse Rating, prior to finalising your lease. **Once your lease is confirmed, see Scenario A or B.**	3.3 Lease negotiations

D You're looking for new premises ...

What can you do?	The handbook shows you how
Seek a 3-star or higher greenhouse rating for the building from your prospective landlord and consider aiming for 3,4 or 5 stars for your own tenancy.	3.1 Benchmarking your greenhouse performance
Investigate opportunities to incorporate energy efficiency into your lease arrangements (e.g. include energy performance clauses in the contract).	3.3 Lease negotiations
Seize the perfect savings opportunity and incorporate energy efficient technologies into the design and fitout:	3.4 Fitouts
• Assess the efficiency of the lighting system, and consider upgrades to more efficient technology where appropriate. Consider self-funding options to achieve upgrades with guaranteed savings.	4.1 Lighting 3.7 Energy Performance Contracting
• If you need new office equipment, choose energy efficient models.	4.2 Office equipment
• Buy an energy efficient hot water unit and a fridge with a 5-6 star energy rating if replacing equipment.	4.3 Other equipment
• If you need extra airconditioning for your computer or conference rooms, choose an energy efficient model.	4.4 Supplementary airconditioning
Consider a site near public transport corridors and encourage use of alternatives to car transport. **Once you've moved in, see Scenario A or B.**	3.8 EnergySmart transport

E You'll be the first tenant in a newly developed building and you're negotiating a lease before the building is completed...

What can you do?	The handbook shows you how
Explore opportunities in your lease to incorporate energy efficient initiatives for both the base building and your premises.	3.3 Lease negotiations
Incorporate energy efficient technologies into your office design and fitout.	3.4 Fitouts 4.1 Lighting
Consider self-funding options to achieve upgrades with guaranteed savings.	3.7 Energy Performance Contracting
Enable ENERGY STAR on your office equipment. If you need new office equipment, buy energy efficient models.	4.2 Office equipment
Buy an energy efficient hot water unit and a fridge with a 5-6 star energy rating for your kitchenette if required.	4.3 Other equipment
Install an energy efficient airconditioning unit for your computer or conference rooms if required.	4.4 Supplementary airconditioning
Once you've moved in, see Scenario A or B.	

F You plan to upgrade your office fittings...

What can you do?	The handbook shows you how
Seize the perfect savings opportunity and incorporate energy efficient technologies into your office upgrade:	3.4 Fitouts
Investigate the viability of:	
• upgrading lighting equipment and controls (biggest savings opportunity for tenants);	4.1 Lighting
• funding upgrades through future savings under an Energy Performance Contract;	3.7 Energy Performance Contracting
• buying energy efficient models if you're replacing office equipment;	4.2 Office equipment
• buying an energy efficient hot water unit and a fridge with a 5-6 star energy rating if replacing equipment; fitting timers to existing water units;	4.3 Other equipment
• if you need extra airconditioning for your computer or conference rooms, choosing an energy efficient model.	4.4 Supplementary airconditioning
See also scenario A or B.	

3

Working EnergySmart

Working Energy Smart

Good advice on how to take advantage of key opportunities to implement your energy efficiency initiatives.

Section 3: Working EnergySmart

3.1 Benchmarking your greenhouse performance

Using the Building Greenhouse Rating software can help you set a benchmark against which you can measure your energy efficiency and greenhouse performance.

The rating software on the Building Greenhouse Rating website allows you to assess the greenhouse performance of your premises. The ratings are based on energy-related greenhouse gas emissions, adjusted to account for climate and how the building is used. The more stars (up to 5), the better the performance.

Once you've done a self-assessment, you can apply for a formal rating which you can then use to promote your environmental responsibility.

To use the rating software, follow the instructions on the Building Greenhouse Rating Scheme website **www.abgr.com.au**.

To rate your tenancy

1. **First select the type of rating (i.e. tenancy), and enter the required information.** This includes:
   - your last 12 months' energy bills (electricity and gas);
   - the hours of operation for your office;
   - the number of people and computers in your office;
   - the gross floor area of your office.

   Use the "Guide to Collecting Data" on the website, to help you.
2. **Calculate your star rating to see how well your office space is performing.**

If you rate 2 stars (or less) you are likely to be wasting money on energy. The handbook highlights a number of low or no cost actions you can take to reduce your energy costs and improve your rating.

If you rate well (3 stars represents current best practice), you can showcase your performance by taking out an official rating to promote your organisation.

An official rating gives you the right to use the scheme's trademark to promote publicly the performance of your premises. Check the Building Greenhouse Rating Scheme website (**www.abgr.com.au**) for information about how to arrange for an accredited assessor to carry out an official assessment of your offices or to validate your self-assessment.

For State contact details go to www.abgr.com.au

What the stars mean to your tenancy

The stars and your tenancy's greenhouse gas emissions

Star rating	*Energy use (MJ/m²)*	*Tenancy greenhouse gas emissions (kg/m²)**
Out of range	More than 624	More than 173
1	524–623	145–173
2	424–523	118–145
3	324–423	90–118
4	223–323	63–90
5	Less than 223	Less than 63

* Assuming no Green Power used

Note: These figures are for tenancies in NSW. Refer to the *Technical Report* on the website – www.abgr.com.au – for star ratings in your state.

How can you improve your rating?

1. **Use less energy while still maintaining or improving service levels.**

The resources in this handbook will help you make energy efficiency improvements to your offices. These actions will reduce your ongoing energy costs as well as improve your tenancy's greenhouse rating.

2. **Switch to energy sources that produce less greenhouse gas emissions.**

Your rating depends on the *type* of energy you use as well as how efficiently energy is being used. Gas, cogeneration and renewable energy generation are all less greenhouse-intensive energy sources than coal-generated electricity.

Most energy retailers now give you the option of having the equivalent of your energy needs provided from renewable energy sources. This option is generically known as *Green Power* and is accredited by SEDA to ensure that the premium paid by *Green Power* customers is invested in new renewable generation. Since the BGR rating is based on greenhouse gas emissions, the use of renewable energy gives a higher rating than would be achieved from energy sourced from more greenhouse-intensive sources.

Influencing your landlord or the building energy manager to purchase at least some of the building's energy as *Green Power* would also mean more stars for the base building, and contribute to reductions in greenhouse emissions.

Green Power - how your business can benefit

Green Power is a national program to promote electricity generated from renewable sources. When you buy a Green Power-accredited product, your electricity retailer purchases renewable energy from sources such as solar, wind, biomass and hydro.

Usually, a Green Power tariff involves paying a few cents more per kWh of electricity so the supplier can finance the development of renewable energy sources. However, if you invest in energy efficiency at the same time as choosing a Green Power option, you can reduce both total energy costs and greenhouse gas emissions.

Joining a Green Power program can help to grow your business:

- *It will position your company as a leading corporate citizen.*
- *It will boost your Building Greenhouse Rating for your tenancy.*
- *It is an easy way to put your environmental responsibility into action.*
- *It will differentiate your company from your competitors.*
- *You may utilise the Green Power logo for promotional purposes.*
- *Your organisation may feature in PR campaigns run by SEDA and your energy retailer.*
- *You will be demonstrating leadership in your industry and the wider business community.*
- *You will be making a direct contribution to reducing greenhouse gases.*
- *You will be supporting the development of a new industry sector.*

With electricity accounting for a small percentage of most organisations' total annual expenses, Green Power is likely to be a minor cost in your company's overall budget. For example, for an annual energy bill of $2,500, a selection of 10% Green Power is likely to cost only $5 per month, while a selection of 100% Green Power is likely to cost only $52 per month.

The commercial reality of the newly competitive power market means that choosing Green Power may not cost you any extra when you factor in the reduced cost of electricity (more than 30% lower in many cases). You can allocate a small part of your power savings to Green Power and be no worse off financially – a win for you and the environment.

If you are a 'contestable' energy customer, make sure you indicate your desire for Green Power when you are negotiating the contract with your chosen electricity retailer (see section 3.6)

More information

Building Greenhouse Rating Scheme: www.abgr.com.au

Green Power: www.greenpower.com.au

5 stars for SEDA Sydney offices

The Sustainable Energy Development Authority's offices in Sydney's CBD prove that a top star rating can be achieved in energy efficient, low greenhouse-intensive premises. Occupying levels 6 and 10 of the KPMG building, these environmentally friendly city offices have been officially given a tenancy greenhouse rating of 5 stars. The NSW government agency is also saving big bucks on their energy bill. ***How did they do it?*** *Cost-effective lighting upgrades and the use of high efficiency appliances and ENERGY STAR-enabled office equipment. For further details, see section 3.4* Fitouts.

Rated area:	*669 m^2*
Hours of occupancy:	*47 hours/week*
Number of people in rated area:	*34 people*
Number of computers:	*34*
Energy use:	*232 MJ/m^2*
Energy supply details:	*100% Green Power (renewable energy sources)*
Normalised emissions:	*0 kg CO_2/m^2 per year*
Raw emissions total:	*0 kg CO_2 per year*
Emissions per person:	*0 kg CO_2/person per year*
Star rating:	*5 stars*

Commonwealth department achieves 4-star rating

The Commonwealth Department of Public Prosecutions has been officially awarded a 4-star tenancy rating by the Building Greenhouse Rating Scheme. Located in the Pacific Power building in Sydney's CBD, this organisation provides a leading example of how good environmental performance pays off - a model for other tenants occupying city high-rise buildings. ***How was it achieved?*** *Turning off computers at night and weekends, and encouraging staff via email reminders to switch off office equipment and lights when not needed. All computer monitors are ENERGY STAR-enabled.*

Rated area:	*4979 m^2*
Hours of occupancy:	*60 hours/week*
Number of people in rated area:	*131 people*
Number of computers:	*150*
Energy use:	*269 MJ/m^2*
Energy supply details:	*0% Green Power*
Normalised emissions:	*70 kg CO_2/m^2 per year*
Raw emissions total:	*349,256 kg CO_2 per year*
Emissions per person:	*2666 kg CO_2/person per year*
Star rating:	*4 stars*

3.2 Your office energy management program

Energy management in your workplace is not just about identifying opportunities, investigating initiatives and getting funding approval. The success of your program hinges on staff involvement – the primary driver behind efficiency and conservation efforts.

By assigning responsibility to key personnel, developing an energy policy and educating your staff, you can motivate people to help you achieve the savings you want, while empowering them with the tools to contribute.

Simple tips

Create an **energy management team** to handle energy conservation and efficiency issues.

Keep your staff informed:

- Regularly report progress against objectives in your energy management program – inform employees of performance successes and failures in your staff newsletters and via internal email.
- Post simple clear messages on staff noticeboards outlining handy energy saving tips, energy efficiency initiatives and latest CO_2 savings.
- Stick posters around your office reminding staff to switch off lights, turn off computers and use power-saving functions on photocopiers. Examples are provided in the *Tools* section (5.1).
- Circulate an EnergySmart newsletter to staff providing energy-saving hints for the home (e.g. distributed monthly or at the start of each season). Again, you'll find some examples of possible articles in the *Tools* section (5.1).

Reward and recognise energy saving efforts by staff members. For example, initiate a staff competition linked to environmental ideas for your workplace.

Taking responsibility for energy management

The first step to getting a program started is to identify a member or members of staff who can play a key role in saving energy – to devise and organise investment in projects, oversee and report on energy efficient practices in the office and secure internal support for the program.

In large organisations, energy management is often the direct responsibility of an appointed energy manager. However, for smaller businesses, a formal position does not often exist and in many cases, responsibility falls on the accountant or financial officer.

If no energy manager exists in your organisation, nominate a key employee (e.g. an 'energy champion') to be responsible for initiatives, purchasing policies and management related to energy in your office.

The energy manager or team should ideally:

- be located in a position that closely aligns with the organisation's conventional management structure;
- possess project management, innovative problem-solving, financing and communication skills, along with knowledge of technology and energy issues;
- be able to effectively facilitate the coordination of energy efficiency matters across the organisation.

Seek commitment of senior management for the energy management program. Their continual support – in terms of cooperation and resourcing – is important for its success.

Active participation by staff at all levels, is crucial – it can make or break energy conservation efforts.

Consider developing an energy management policy

Writing a simple energy management policy can provide a framework for developing objectives and implementing programs relating to energy use across the entire organisation. An effective policy is one that that is tailored to your particular company culture. It should include:

- a declaration of commitment from senior management;
- general aims and specific targets;
- an action plan;
- resources;
- accountability;
- review procedures - a monitoring and reporting system;
- budgetary considerations.

Having a policy is a great idea, as it:

- safeguards your organisation's attempts to manage energy consumption;
- helps guide and focus efforts for improving office energy efficiency;
- communicates your commitment to saving energy inside and outside your organisation;
- helps to motivate staff and management;
- establishes the overall direction for an integrated company-wide approach to energy management and sets targets against which performance can be judged.

Widespread consultation is the key to a successful energy policy. Ensure that all staff are given the opportunity to contribute and participate in the development process. In this way, you are more likely to gain acceptance for it and guarantee their involvement in the proposed actions.

Set up a monitoring and reporting system

Effective monitoring and reporting of your organisation's energy use and performance are crucial parts of ongoing review. Setting up a system to collect, analyse and report on your organisation's costs and consumption will help you to:

- maintain savings from existing energy efficiency investments and initiatives;
- identify any new opportunities for savings;
- create a solid database to enable cost control and external comparison;
- understand trends of energy consumption in your office;
- monitor greenhouse impact;
- communicate progress for your energy management program internally and externally.

The system should record both historical and ongoing energy use, as well as information to undertake Building Greenhouse Rating self-assessments, and be able to produce summary reports on a regular basis.

Using indicators such as the annual energy use for your organisation, or benchmarks such as the Building Greenhouse Rating, can help you measure your performance and identify opportunities for improvement.

Educating and motivating your staff

The value of encouraging participation and cooperation by staff and management in using energy wisely should not be underestimated. Ongoing motivation and education are keys to the success of improving energy efficiency in your office.

Keeping staff abreast of energy management activities and raising individual awareness of greenhouse issues can generate real benefits:

- It **encourages participation and environmental responsibility** – the more support, the more effective your energy efficiency program/initiatives will be.
- It helps **dispel the misconception** that energy saving measures result in loss of amenity.
- It **boosts staff morale and pride** – as people are made to feel part of the solution.

Improved cooperation and communication towards a common goal can help foster employee unity and harmonious workplace relations.

1. Communication is education

Regularly communicating your program plans and progress to staff reminds them of the value of their contribution and helps fuel ongoing enthusiasm and participation. Provide feedback via newsletters, signage/posters, memos, billboards, reports, internal bulletins, email, or meetings on:

- energy efficiency initiatives;
- handy hints for conserving energy in the office (and at home);
- news on global warming and the greenhouse effect;
- results of progress against targets (e.g. Building Greenhouse Rating) to:
  - publicise savings (dollars and greenhouse gases);
  - report problems and propose ideas for improvement;
  - highlight lessons learnt from failures.

Publish information in your shareholder magazine (if applicable) and Annual Report; shareholders will be very interested to hear how saving energy impacts on the bottom line.

2. Encourage active participation

- Make **involvement of key personnel** in energy efficiency activities a priority; create an energy management taskforce or team to coordinate initiatives and motivate the rest of the organisation into action.
- **Encourage constructive feedback** from staff in regular meetings; establishing a staff suggestion scheme can assist the continual improvement of program design.
- **Recognise successful efforts**; run an office competition for ways to make the workplace more energy efficient and environmentally friendly, offering a small reward (e.g. a Smart Showerhead for the home) or incentive for an employee who saves the most money or provides the best suggestion.

3. Use training programs to raise awareness

Incorporate efficient energy management and use of equipment and technologies into existing training programs. Ensure that all energy efficient practices are included in staff induction processes for new employees. Apart from knowing how to enable ENERGY STAR on their office equipment and operate lighting systems more efficiently, staff also need to be made aware of;

- why energy savings are important - budget issues and greenhouse impact;
- how their everyday behaviour affects energy consumption;
- what actions can be taken;
- how they will benefit.

Use the sample articles and tip sheets provided in section 5.1 for your staff newsletters and internal emails; photocopy the sample posters to post around your offices – or create your own.

More information

- Sustainable Energy Authority (was Energy Efficiency Victoria) – Energy Smart Government website (www.sea.vic.gov.au)
  Tips on energy management including sample policy, staff awareness plans, monitoring and reporting and more.
- *Down-to-earth Officecare – A practical guide to environmental action in the office* (1997). Fuji Xerox Australia Pty Ltd (www.fujixerox.com.au)
- *Energy Management* (2000). Energy Efficiency Victoria (now Sustainable Energy Authority) and SEDA, Melbourne.

SUCCESS STORY

Regular energy updates for staff in government agency

The Sustainable Energy Authority (previously Energy Efficiency Victoria) produces quarterly EnergySmart Government newsletters to inform staff of current energy management activities. These updates are displayed regularly on noticeboards and circulated periodically via internal electronic bulletins.

Tips for improving energy efficiency in the home are often provided – as staff may be more motivated to conserve energy at home and these practices will translate to workplace. So the benefits are twofold.
Example: home lighting tips plus a calculator to measure savings

3.3 Lease negotiations

When you're looking for new office space, key factors usually include location, cost, size, functionality and parking. Rarely does energy efficiency feature among the top criteria for choosing premises. Moreover, energy costs are often 'hidden' in the catch-all of 'outgoings' in your rental agreement.

But incorporating energy efficiency into your lease arrangements is both financially and environmentally smart. In this way, you can influence the operating costs of the building, which could lead to reduced outgoings. This not only means significant savings for you and your landlord in the long run, but you are also reducing the building's greenhouse impact.

Opportunities to consider energy efficiency occur with:

- new lease and/or lease pre-commitment arrangements;
- lease renewals or refurbishment negotiations.

Understanding lease costs

As a savvy tenant, you should understand the implications of your lease arrangements and leverage the agreement to support your organisation's objectives for an energy efficient and cost-effective business operation.

Your total leasing cost comprises:

- a rental sum ($/m^2)
- 'outgoings' – base building operational expenses ($/m^2), for example:
  - maintenance and cleaning,
  - base building energy costs including heating, ventilation and airconditioning (HVAC), foyer lighting, pumps, fans, central hot water.

The lighting and power in your own office space are not usually included in the lease costs; you pay the electricity supplier for these directly (see 3.6 *Negotiating an energy supply contract*).

Understanding exactly how the 'outgoings' component of the lease cost is structured and how all services are provided is the best basis for negotiations with your prospective landlord. Beware of hidden energy costs such as the installation of a cheap, inefficient airconditioning system metered from your electrical distribution board.

Also, since almost 50% of the total greenhouse gases come from base building activities, lease negotiations provide the best opportunity for the tenant to influence a building's greenhouse performance.

Lease structures

There are generally three types of commercial lease:

- **Net lease** – rent does not include outgoings (base building costs) which are paid by tenants.
- **Gross lease** – rent includes all outgoings (i.e. landlord pays for base building costs up-front and is reimbursed via tenants' rental payments).
- **Semi-gross lease** – rent includes all outgoings except statutory costs (e.g. land tax, insurance etc.).

Your lease negotiations are a great opportunity to consider energy efficiency initiatives – with the potential to save money for both you and your landlord.

Reduced outgoings also adds value to the property – an extra benefit for the building owner.

1. Investigate before you negotiate

All businesses need to know they are getting good value from their expenditure on energy. Be prepared to do some preliminary research in order to identify opportunities and issues to be raised in lease negotiations.

- Ask the potential landlord or building manager whether an official Base Building Greenhouse Rating has been undertaken for the building. You can use the results in your appraisal of prospective office space. Lower star ratings will indicate that you are paying too much for energy. A high star rating can mean reductions in outgoings for energy costs and therefore lower bills for you.
- Find out from the landlord or property manager which aspects of energy use tenants pay for via meters and which are covered in the landlord's bills. Clarify on what basis you contribute to communal energy costs, whether there is any program to reduce those costs, and whether there are arrangements to share any savings (or increases) between tenants and landlord.
- Investigate the feasibility of changing building operations to enhance energy efficiency; for example, can building controls allow staff to initiate lighting on demand at the start of the day?
- Find out if the landlord has plans to implement energy efficiency projects in the base building and/or tenant's space, including:
  - lighting upgrade options and cost scenarios (in tenant's office space), including use of control systems, zoning, high-efficiency fittings and luminaires;
  - viable options that could increase the efficiency of the heating, ventilation and airconditioning system (HVAC), for example, system upgrades, controls, adjustment of thermostat settings, maintenance;
  - likely cost reductions from alterations to base building and office hot water systems, including use of automatic or manual after-hours timers and temperature controls.

Questions to ask building owners, real estate agents and solicitors when looking for office space

- *Type of lease structure (gross or net type)?*
- *Type of power purchased for the space (standard or Green Power)?*
- *Average cost per square metre for base building energy consumption (electric, gas and other)?*
- *Who owns larger power-consuming items (such as airconditioning system) and are they metered via the landlord's meter or the floor tenancy meter?*
- *Is after-hours airconditioning included in the outgoings? How is it metered and apportioned?*
- *Is there a Building Management System (see box next page)? And how often is it checked and recalibrated? (Sensors and controls should be checked/maintained/recalibrated every 6–12 months to ensure the BMS is functioning properly and set up to maximise energy savings.)*
- *Does the building have a Building Greenhouse Rating? If so, what is it? What plans are in place to improve the rating?*
- *What energy efficiency initiatives have been made in the office space and building to date?*
- *At refurbishment time, will consideration be given to upgrading or installing energy efficient building plant services? On what basis would projects be given the go-ahead e.g. a specific internal rate of return (IRR)?*
- *Does the landlord have an ISO14000 plan (Environmental Management Plan) in place? If so, what energy efficiency incentives have they introduced?*

What is a Building Management System (BMS)?

A Building Management System (BMS) is a central computerised system for managing and operating systems within a building. A BMS usually incorporates controls for energy management, maintenance management, security, access and fire systems.

A BMS is an essential tool in tuning the operation of any building and, just like a well tuned car, a well tuned building not only runs more efficiently, it generally provides better performance. This ensures that operating costs are minimised and occupants are more comfortable.

To manage energy use, it can monitor various parameters in the building such as temperature, humidity, energy consumption and occupancy patterns. By doing so, services such as airconditioning, ventilation and heating, lift services, hot water systems and lighting can be controlled in ways that minimise energy use while optimising comfort and functionality.

2. Negotiating your lease arrangement

Influencing best practice energy management for base building services

Through the lease format

- Some buildings only offer net leases. However, in times of oversupply, you are in a strong bargaining position to request the type of lease format you prefer.

  Gross lease arrangements allow the building owners to see – and benefit from – energy savings from efficiency projects, creating a stronger incentive to invest in efficient equipment. A net lease provides less incentive, as energy costs are passed on directly to you as the tenant.

  For example, you could negotiate a gross lease arrangement where airconditioning costs are incorporated as a flat lease rate, instead of an outgoing passed to you. This creates an incentive for building owners to provide central cooling services in the most cost-effective and efficient way.

  It is important to note that net and gross leases can differ in costs to your organisation. Risk premiums associated with gross leases can mean that you may be paying more for this type of arrangement.

  So before you decide on the lease arrangement best suited to you, find out about the financial implications of each lease type.

Through energy performance clauses

- Specific clauses can be inserted in lease arrangements to encourage improvement in the base building energy use.
- In both net and gross leases, there is a clause that outlines the outgoings payable by the tenant during the term. During initial negotiations, you can insert energy performance clauses in this section to ensure building services are managed to the required specifications.
- These specifications can include kWh/m^2 benchmarks and a commitment from your landlord to achieve an agreed level of Base Building Greenhouse Rating (e.g. 3 or more stars) within a specified time e.g. 12 months. These types of benchmarks should also be supported by thermal and lighting comfort performance indicators (say, 21°± 3° or 320 lux/m^2 lighting levels) and regular audit assessment periods (at least annually). See the Model Energy Performance Clause on the next page as an example.

Model energy performance clause

Clause x

a) Further to the above, the following Key Performance Indicators (KPI) should be met by the landlord. If the performance levels are not met at any time during the term of the lease, a penalty payment must be paid to the lessee.

b) Design criteria:

Lighting consumption levels – x W/m²

Airconditioning consumption levels – cooling at x W/m²; heating – at x W/m²

c) Performance criteria:

Base Building Greenhouse Rating - at least 3 stars.

Lighting levels – 320 lux (Australian Standard for 'routine office tasks' is 320 lux)

Thermal comfort – 21 degrees ± 3 degrees

Fresh air – 10 litres/second per person

d) Quarterly and annual energy reports must be produced outlining the performance of the building in relation to the KPIs, and total energy consumption for house loads.

Other important considerations

- Raise the issue of **Energy Performance Contracting** to help fund energy efficiency initiatives and meet performance targets you and the building owner set for the base building. Explore opportunities for you and your landlord to share savings opportunities. See section 3.7 *Energy Performance Contracting*.
- Explore opportunities for the building owner to purchase at least some of the building's electricity as **Green Power**. When combined with an effective energy efficiency program, this will cut both costs and greenhouse gas emissions as well as give the building a higher greenhouse rating.
- Request a **regular maintenance program** for the base building that may include reference to energy management practices and performance levels of building services operation. Continuous service of HVAC systems and regular cleaning of light fittings is crucial for maintaining proper performance and efficiency.
- If not already in place, request **separate monitoring and cost apportioning of after-hours airconditioning** (for buildings with multiple tenancies).
- Ask the building owner about energy efficient incentives within the lease that may be offered in office **refurbishments or fitouts**, and where they will share the costs for fitouts that lower building heat loads, reducing demand on the base building airconditioning system.

You could also provide the building owner with suggestions for energy management and possible efficiency initiatives they could undertake in the building to achieve significant energy and cost savings.

For example, in **lighting**

- Upgrade lighting to best technology throughout the building, carparks, etc. Emphasise that the building owner will gain airconditioning energy savings, because more efficient lighting generates less heat. When sharing the costs, make sure this saving is included as a benefit for the landlord, along with reductions in maintenance costs due to longer lamp life.
- Convert from incandescent and halogen lighting in common areas and lifts (see *Lighting* section 4.1 for options). Lights in lifts usually stay on continuously, so large savings can be enjoyed by installing energy efficient lighting.

And with the **heating, ventilation and airconditioning (HVAC) system**, which accounts for 30-35% of electricity costs in commercial buildings:

- Identify opportunities to improve the building envelope's thermal performance characteristics (e.g. draughtproofing, shading or window films on windows exposed to sun).
- Call in an independent expert to review maintenance practices and identify areas for efficiency improvement.
- Establish a strategy for ongoing improvement plus regular cleaning and servicing – thorough maintenance procedures can reduce the base building airconditioning bill by up to 25% and more in many cases.

SUCCESS STORY

The 60L Green Building Project – A leading example

Demonstrating commercial viability of environmentally sustainability design in practice.

As part of a joint initiative between the Green Building Partnership and Australian Conservation Foundation (ACF), a property in Victoria is being converted to office units in accordance with ecological sustainability principles.

Property Owners:
The Green Building Partnership (two ethical investment companies)

Location:
60-66 Leicester Street, Carlton, Victoria

Floor Space:
3750 m^2 lettable

Participants:
Consortium of designers, consultants and architects

Principal Tenant:
Australian Conservation Foundation (National Headquarters)

Date of Completion: *July 2001*

This unique development is set to be a model of superior environmental performance for green commercial buildings in Australia. The building will have low environmental and greenhouse impacts. Key efficiency improvements will be made in energy, water and materials use, resulting in reduced operating and capital costs.

*To engage incoming tenants in the building's green management, occupants will be asked to sign a **green lease**. This agreement outlines the various obligations of both the landlord and tenant in relation to the Green Building Principles, and includes details of the building's environmental management framework and fitout guidelines. Obtain a copy of a green lease for ideas on how to incorporate energy efficiency and environmental issues into your own lease agreements.*

For further information, contact Alistair Mailer (Green Building Project Manager) Ph: (03) 9926 6278 or greenbuilding@acfonline.org.au, www.60Lgreenbuilding.com

Shared benefits for tenants and landlords of an office lighting upgrade

Benefits to landlords	Benefits to tenants
Increased net operating income	*Reduced occupancy costs*
Higher Building Greenhouse Rating	*Higher Tenancy Greenhouse Rating*
Increased asset value	*No investment in new systems*
Marketing advantage to attract new tenants	*Increased lighting quality*
Improved public relations	*Improved productivity*
Improved relations with tenants	*Reduced lamp and ballast replacement costs*

SUCCESS STORY

Commonwealth tenant signs greenhouse-friendly lease

A Commonwealth agency with office space at 624 Bourke Street in Melbourne has successfully incorporated energy efficiency into their lease renegotiations with assistance from their leasing agent, CB Richard Ellis. Both the landlord and leasing agent have agreed to meet demands outlined in specific contract clauses (shown below) addressing energy conservation measures and regular mechanical services maintenance (i.e. for base building air conditioning, lighting etc.).

By demonstrating initiative in ensuring energy efficiency for their building, this Victorian tenant is not only guaranteeing themselves and the owner energy plus dollar savings, but also better greenhouse performance.

Clause 6.10 Energy Conservation

* *The mechanical services shall be of an energy efficient design to provide reasonably low running costs during normal hours.*
* *The mechanical services shall be of an energy efficient design to provide reasonably low running costs during after-hours operation.*
* *An estimate of energy use and operating costs per year shall be provided.*
* *The Mechanical Services Plant shall operate and be maintained at maximum efficiency at all times.*

Clause 6.12 Commissioning and Maintenance

* *Installed mechanical services are to be fully tested, balanced and commissioned by competent, experienced personnel.*
* *Provide commissioning and test data within comprehensive manuals covering operation and maintenance requirements. Manuals are to specifically include schedules and details of proposed water treatment, plant inspection and cleaning of plant items. Copies of all reports are to be provided to "x" on an ongoing basis.*
* *The lessor is required to enter into a monthly service contract for the maintenance of the air conditioning system with a reputable air conditioning contractor...*

NEW REQUIREMENTS FOR GOVERNMENT AGENCIES

Commonwealth sets greenhouse gas reduction strategies for its own tenants

If you are a Commonwealth agency, you are now obliged to meet specific mandatory requirements in your tenancy or ownership of commercial buildings, which are aimed at improving energy efficiency in Commonwealth operations. Requirements outlined in the Commonwealth Energy Policy include:

- *All newly constructed buildings, whether Commonwealth-owned or where the Commonwealth is the majority tenant, must meet a minimum energy performance standard.*
- *All substantially refurbished buildings must also meet a minimum energy performance standard.*
- *All new lease agreements for commercial buildings must include a clause specifically prohibiting the cost of energy used by building central services during normal working hours from being recovered as an outgoing. This will ensure that building owners have an incentive to improve the energy efficiency of building central services.*
- *Energy audits of all building space must be undertaken within one year of occupancy and thereafter at intervals not exceeding five years.*
- *All cost-effective energy saving measures (internal rate of return ≥ 15%) identified in the audits must be implemented.*
- *All new office equipment procured is to be ENERGY STAR compliant. All new appliances are to have a four star or better energy rating.*

For more information, contact the Australian Greenhouse Office (02) 6274 1656, or the Department of Industry, Science and Resources (02) 6272 4773.

Ask the Australian Greenhouse Office about their Working Energy Program which provides a set of tools to assist Commonwealth agencies to improve energy efficiency.

www.greenhouse.gov.au/government_op/workingenergy

SUCCESS STORY

Government agency enjoys significant savings from smart lease arrangement

In their lease negotiations for new premises in 1998 (floor area of 748 m^2), Energy Efficiency Victoria (now Sustainable Energy Authority) incorporated airconditioning operating costs as a flat lease rate, instead of an outgoing passed to them. Base building energy costs for common services, including airconditioning, are fixed in the lease at $4,000 per year.

This not only provides an incentive for the building owner to provide the service in the most efficient and cost-effective way, but has resulted in around 25% cost savings for the agency (includes savings from energy efficient office lighting upgrade).

More information

- Pacific Gas and Electric Company's Smarter Energy Purchasing Guide – *Sharing Energy Efficiency Savings Between Landlords and Tenants*

http://www.pge.com/customer_services/business/energy/smart/html/landlord_tenant.html)

3.4 Fitouts

If you are fitting out your office space, remember to investigate energy efficient technologies – they're a sound investment compared with older technologies and will save you money!

Fitting out or refurbishing your office is the perfect time to consider energy saving options and technologies. Incorporating energy efficiency into the design of your work space doesn't mean you have to pay more. In fact, energy efficient and low environmental-impact design can cost you less up-front than a typical office fitout, while improving the comfort and productivity of your staff – not forgetting the savings you gain in the long term.

A perfect opportunity

Being energy smart at the design stage in your office plans:

- is the **most cost-effective time** to reduce energy;
- will **guarantee benefits** for your business and influence others to follow suit;
- provides the best opportunity to **introduce energy efficiency concepts** to the whole team of staff when they move into a new floor (most facilities groups produce a move-in manual for new fitouts; information on energy saving devices installed could be provided in that manual);
- projects a **positive corporate environmental image** to your employees, customers, shareholders, suppliers and the wider community;
- can deliver a **market advantage** for your business in demonstrating superior greenhouse performance in your premises;
- provides a **practical demonstration** to encourage others to implement energy efficient practices in their offices and at home;
- can lead to **staff satisfaction** and performance improvements that can often be of far greater benefit than the money you save on energy.

Taking action

- Make sure you get a copy of the fitout guidelines for your tenancy from the real estate agent or building owner to be certain that your plans comply with building requirements. It is crucial to seek approvals for your design from the relevant authorities (e.g. local councils) and building owners. By playing it safe in this way, you can avoid breaching lease agreements and statutory requirements.
- Consider employing an energy consultant who can advise you on the latest energy efficient technologies, such as lighting and lighting control systems, and give you solutions tailored to your office needs. The consultant can also provide accurate figures for capital outlay and potential savings.
- Take advantage of energy efficient options already employed in the building (e.g. electronic ballasts); ask the building manager or owner about existing opportunities.
- Think about using building materials and furniture that have low environmental impact, and maximise recycling and salvaging e.g. by using recycled timbers and non-toxic paints. Prices for environmentally friendly products are often competitive with standard materials, and can provide increased comfort and better indoor air quality in the workplace.
- Get informed: shop around and ask designers and suppliers about environmentally appropriate and energy efficient products (examples of questions are given on page 41). By committing to an environmental purchasing policy at the start, you can set certain performance standards for future office alterations and new office equipment. Your support for suppliers of resource and energy efficient goods and services also helps drive the market towards ecological sustainability.

MISSED OPPORTUNITY

Organisation loses out on $50,000 savings potential in fitout opportunity

A Sydney-based business did not take advantage of energy efficient technologies when fitting out its offices. This missed opportunity created significant costs that could have been avoided over the life of the tenancy. SEDA has conservatively estimated a savings potential of at least $50,000 a year had lighting controls been implemented at the fitout stage and ENERGY STAR enabled on office equipment. By implementing these initiatives, the tenant could have achieved an increase in their tenancy Greenhouse Rating from 2 to 4 or 5 stars.

Total floor space area: *30,600 m^2 (17 floors)*

Staff numbers: *1 person per 15 m^2*

Computers: *1 per staff*

Occupancy: *45 hours per week*

Estimates of tenancy energy performance with various energy efficient technology projects implemented at fitout stage:

Project	Annual energy cost	$/m²	MJ/m²	$kgCO_2/m^2$	Building Greenhouse Rating
Basic lighting control (off at night and weekend).	*$250,000*	*$9*	*430*	*110*	*2–3*
Good lighting controls and implement ENERGY STAR on office equipment.	*$190,000*	*$6*	*230*	*65*	*4*
Optimum: Best lighting controls and equipment use.	*$125,000*	*$4*	*157*	*41*	*5*

Refurbishing your office?

Questions to ask designers and suppliers

Lighting

Can you incorporate:

- high-efficiency lamps?
- low-loss ballasts, preferably electronic?
- high-efficiency light fittings?
- innovative ways to maximise natural light?
- movement detectors, timers, light sensors?

(See section 4.1 *Lighting* for more information.)

Office appliances

- Do all computers, monitors, printers, fax machines and photocopiers have a 'sleep' mode facility (ENERGY STAR) and is it enabled?
- Are kitchen appliances highly efficient (e.g. energy rating of 5 stars or higher)?
- Can you fit a 24-hour, 7-day timer on the hot water system?

(See sections 4.2 *Office equipment* and 4.3 *Other equipment*.)

Other environmental considerations

Office planning

- Does the planning and design of the office facilitate flexibility in the office layout, and minimise the demand on building services?

Furniture and work stations

- Are the surfaces polyurethane-free and finished with natural products?
- Are chairs/couches stuffed with natural materials?
- Is there a buy-back policy for when the product has reached the end of its life with your organisation?
- Is timber sourced from plantations or being reused?
- Does any particle-board material produce minimal emissions of volatile organic compounds?

Flooring

- Are your products and adhesives free of volatile organic compounds?
- Do you need carpet?
- Are your carpets mechanically fixed (rather than fixed using adhesives)?
- Are materials sourced from recycled or renewable products?

Walls and doors

- Can you build from steel or timber rather than aluminium, and incorporate recycled material?
- Are your paints based on plant products?
- Do your paints minimise emissions of volatile organic compounds?

Fitout contractors

- Do site demolition materials and waste get recycled?

More information

- Australian Shop and Office Fitting Industry Association (ASOFIA) (02) 4342 5505; http://www.asofia.asn.au

  ASOFIA is a small organisation that promotes the shop and office fitting industry both within Australia and abroad. Its 250 member companies represent a large percentage of the leading shopfitters in the industry, as well as most of the leading manufacturers and suppliers.
- Royal Australian Institute of Architects (RAIA) (02) 9356 2955; http://www.raia.com.au/home.htm
- Design Institute of Australia (03) 8662 5490; http://www.dia.org.au/
- Property Council of Australia (formally BOMA) http://www.propertyoz.com.au/

  National contact: (02) 9252 3111
  State contacts: ACT (02) 6248 6902; NSW (02) 9252 3111; NT (08) 8981 6440; Queensland (07) 3229 0666; South Australia (08) 8231 2807;
  Tasmania (03) 6224 2530; Victoria (03) 9650 8300; Western Australia (08) 9321 1156

SUCCESS STORY

SEDA'S office fitout: A showcase for energy efficiency and ecologically sustainable design

The Sydney offices of the NSW Sustainable Energy Development Authority provide a working example for tenants of what can be achieved in a typical CBD highrise building in terms of both energy efficiency and environmentally sustainable design.

The total cost per square metre (1997) was less than a typical office fitout ($800/m² compared to more than $900 expected by government fitout standards). Energy consumption has been cut by over 38% and 11 tonnes of CO_2 emissions are saved annually. Staff enjoy increased comfort in the workplace and improved air quality.

Nuts and bolts

The offices were designed to incorporate energy efficient technologies and building materials with minimal environmental impact. The fitout also included the installation of Australia's first CBD rooftop solar power station. Selection of manufacturers was based on their long-term environmental responsibility.

Energy efficient improvements

*A highly cost-effective **lighting upgrade** cutting energy consumption by 38% includes:*

- *daylight sensors to turn off lights automatically when natural light is sufficient;*
- *motion sensors in all enclosed spaces;*
- *new-generation Osram T5 tubes in function spaces (with dimmers);*
- *a current controller on the office lighting.*

*Top-star-rated **appliances** in office and staff kitchen:*

- *4 star Westinghouse 142 Enviro bar-fridge; CFC, HCFC, HFC free;*
- *6 star Dishlex Global 300 dishwasher, with water conservation feature;*
- *Kambrook Axis Cordless kettle made from recycled plastic; 60% more efficient than boiling water unit;*
- *time switch for the hot water system (24-hour, 7-day).*

*ENERGY STAR-enabled **office equipment***

Widespread use of low environmental impact materials:

- *Salvaged blackbutt timber milled flooring;*
- *Furniture made from recycled timber and plastics;*
- *Plantation timber desks finished with Kaldet 270 (primary linseed oil) supplied by Cleanhouse Effect;*
- *Non-toxic plant-based paints – emit no volatile organic compounds;*
- *Hemp sofa coverings, coconut fibre stuffing;*
- *Vegetable dye-treated coir (plant fibre) carpeting;*
- *Medium density fibreboard (MDF) for cupboards and shelving (made from off-cuts);*
- *Herman Miller task chairs made from recycled aluminium and plastic. Buy-back policy with furniture;*
- *Workstations made from recycled blackbutt;*
- *Non-toxic finishes to furniture and walls.*

See next page for details of suppliers.

For further information: Ecologically Sustainable Office Fitout Guidelines (2000) CD-ROM developed by the Queensland Department of Public Works, Building Division. This practical guide can help you achieve an environmentally friendly workplace at all stages of your fitout or refurbishment.

Contact: build@publicworks.qld.gov.au or telephone (07) 3225 1921

Contact details for SEDA fitout

	Feature	Supplier	Telephone
DESIGN AND FITOUT			
	Interior designers, project managers	HBO+EMTB	02 9231 4666
	Interior fitout contractors	Avnir-built	02 9698 4311
LIGHTING			
Control system	Daylight sensors to turn off lights automatically when natural light is sufficient	ECS	02 9983 1144
	Use of motion sensors in all enclosed spaces		
	A current controller on the office lighting		
Lamps	Compact fluorescent downlights	ECC Lighting	02 9380 7922
	New-generation T5 tubes in function spaces (with dimmers)	Osram	02 9481 8399
	Energy efficient T5 light fittings	Pierlite	02 9794 9300
FURNITURE			
Chesterfield couches	Hemp sofa coverings, coconut fibre stuffing	SEDIA	02 9356 3166
Workstations	Plantation timber, finished with natural product Recycled blackbutt	Omni Office Interiors Farron Furniture Co	02 9281 6677 02 9557 2966
Task chairs	Recycled aluminium and plastic. Buy-back policy with furniture.	Herman Miller	02 9552 2300
Waiting chairs	Bull rush and plantation timber	KEZU	02 9810 6166
Boardroom chairs	Plantation timber	DEDECE	02 9360 2722
Cupboards and shelving	Made from medium-density fibreboards (MDF)	Laminex Industries	02 9710 8952
Paints and finishes	Non-toxic plant-based paints – emit no volatile organic compounds (VOCs)	Cleanhouse Effect	02 9516 4681
Countertops	Linoleum made from pine resins	FORBO	02 9738 4800
Workstation screens and upholstery	Made from hemp fabrics	Australian Hemp Products Pty Ltd	02 4955 6666
FLOORING			
Timber flooring	From salvaged blackbutt timber	Rozelle Recycled Building Centre	02 9818 1166
Carpet	Vegetable dye treated coir (plant fibre) carpeting	Natural Flooring Centre	02 9569 6999
PHOTOVOLTAIC SYSTEM			
	Modules	BP Solarex Ltd	02 9727 4455
	Installation	Essex Electrical	02 6689 1142
	Inverter for system	Butler Solar Systems Pty Ltd (now Power Solutions Australia)	03 9706 6716

3.5 Buying new equipment

Operating costs are often not considered when the initial purchase decision is made – suppliers don't readily provide such information and purchasers don't usually ask for it. It's too late once the equipment is installed and opportunities for significant savings are missed.

Don't let this happen in your organisation.

Taking action

1. Find out who in your organisation specifies and purchases equipment. This might be one person, an entire department or a number of people in different areas.
2. Work with the people who make purchases to introduce an additional criterion of 'future running costs' into the decision-making process. Running costs will include the cost of the energy needed to operate the equipment as well as ongoing maintenance costs.
3. Provide your purchasing people with the *Equipment* selection checklist on the next page, which outlines energy issues that should be considered before selecting new equipment. Also check out the purchasing tips in section 3.2 *Office equipment*, and 3.3 *Other equipment*.

The *Buying New Equipment Calculator* will enable them to work out the future running costs of equipment. The calculator is available on the website **www.abgr.com.au**, as well as in section 5 (*Tools*) in this handbook.

Find out about energy consumption

Whether the purchase is for a photocopier or refrigerator, ask your supplier to advise how many watts the equipment draws or the kilowatt-hours per year it uses. Since between 20% and 80% of energy is consumed when equipment is activated but doing nothing useful, you need to obtain two pieces of information in your supplier's quotation:

1. **How much energy does the equipment use when it is 'on' but not operating**. For office equipment, it is relatively easy to find this out since most equipment now has a 'standby mode' or 'sleep mode', which means the amount of energy drawn when the equipment is on but not operating can be set to a specified low level.
2. **How much energy does the equipment use when it is in operation** (e.g. when a photocopier is actually taking photocopies)? With office equipment, for instance, power consumption details can usually be found under 'Specifications' in the operating manual or user guide.

Having obtained the necessary information from equipment manuals or suppliers, you can use the *Buying New Equipment Calculator* and make a comparison between two products.

Make informed decisions when purchasing equipment: ask your supplier how much energy the product will consume per year and calculate the costs.

Equipment selection checklist

Energy efficiency

- *Is the equipment really necessary or are there other ways to provide the service?*
- *Is the equipment the correct size for the job it is required to do? Oversizing of equipment often means it won't work at the optimum level of efficiency.*
- *What is the energy consumption per year when the equipment is 'on' but doing nothing useful? For most equipment, between 20% and 80% of total energy use occurs when it is standing by, waiting to be operated.*
- *Can the equipment be set to a minimum energy consumption level? For many types of office equipment for instance, the ENERGY STAR logo indicates it is fitted with a set low-energy standby mode. See ENERGY STAR procurement tips for your purchasing policy, page 76.*
- *How much energy does the equipment use per year when it is actually operating?*

Influencing others: general environmental considerations

The ways you spend your money can play a major role in influencing others. Through your purchasing criteria, you can drive market transformation by supporting suppliers of products and services that are environmentally responsible and energy efficient.

By choosing waste-saving and resource efficient equipment you are also helping the environment. So, when buying equipment and developing purchasing policies, you should consider:

- equipment with efficient and recycled packaging;
- equipment manufactured from recycled materials;
- capacity to use recycled paper;
- equipment that uses durable, reusable, upgradable and repairable products (e.g. remanufactured toner cartridges for printers);
- efficient use of resources and energy during operation (e.g. easy double-sided copying);
- minimum impact on quality of office environment (e.g. low-radiation computer monitors).

More information

- Pacific Gas & Electric Company, *Smarter Energy – Business Purchasing Guide*

  This guide provides in-depth information on how to talk to suppliers about equipment.

  http://www.pge.com/customer_services/business/energy/smart/purchasing.html

3.6 Negotiating an energy supply contract

The energy market in Australia is becoming increasingly competitive, with more and more customers able to choose their electricity retailer and negotiate their own agreement for electricity supply. If the option of a 'contestable contract' is not already available to your business, it will be soon.

This has major implications for operating and energy costs. If you do your homework and take the time to investigate your options, it can bring real savings.

Negotiating an energy contract provides important opportunities for energy management:

- Achieved savings can be allocated to fund strategies for energy efficiency improvements, which will reduce greenhouse gas emissions and may reduce electricity contract costs even further.
- It provides a stronger argument for establishing monitoring programs to track the energy demand of your office, allowing you to identify energy saving opportunities.

You can also choose to incorporate *Green Power* into your contract, reducing greenhouse gas emissions and improving your tenancy greenhouse rating.

A competitive retail market for energy

The National Electricity Market (operating since 13 December 1998) has introduced competition for the supply and purchase of electricity in the ACT, NSW, South Australia, Queensland and Victoria.

This means that all electricity users from large companies down to small business and household levels will be able to choose their retailer based on price, quality, services and other factors. Choosing a new energy supplier does not mean changing the pipes and wires to your business. It's about who buys energy on your behalf from the power plant and bills you for the energy you use.

When will you be able to choose your energy retailer?

Eventually all customers in most states will be able to select their energy retailer (full retail competition). In the ACT, Queensland and Victoria, this is planned to occur from 1 January 2001, in NSW from 1 January 2002, and from 2003 in South Australia.

The date when your organisation's supply becomes contestable depends on the amount of energy you buy and where your offices are located – see the contestability timetable on the next page.

The best deals go to the best informed

Negotiating an electricity contract will be a new experience for most people, and it's crucial that you arm yourself with information in order to maximise the benefits and savings available. You may have to sign a new contract every year, depending on the terms you agree on.

1. Know your current electricity costs

Look at your energy bills to get an idea of how much you spend on electricity. This will help you compare the quotations offered by various retailers with what you are currently paying.

2. Understand the pricing structure and new tariff structures

Electricity **contract costs** include:

- contestable charges for electrical energy (kWh);
- regulated charges for electrical energy (kWh) and electrical demand (kW or kVA); and
- regulated fixed charges, e.g. for metering.

Negotiating an agreement with an energy supplier can result in savings on energy bills of up to 20%, with further savings of 40% to be gained from energy efficiency.

Contestability timetable*		
State or Territory	**Electricity**	**Gas**
NSW	Large businesses (energy use more than 160 MWh/year, or approx. $15,000): already contestable Medium-sized businesses (energy use 100–160 MWh/year, or $10,000–$15,000): from 1 January 2001 Small businesses (energy use 40–100 MWh/year, or $4,000–$10,000): from 1 July 2002 Small businesses and households (<40 MWh/year) – from 1 January 2002	Energy use more than 1000 GJ/year (approx.$10,000) - already contestable Remaining customers - July 2000
Victoria	Energy use more than 160MWh/year (approx.$15,000) – already contestable Small businesses and households - January 2001	Energy use more than 100,000 GJ/year (approx.$500,000) – already contestable Remaining customers – September 2001
Queensland	Energy use more than 200 MWh/year (approx.$20,000) – already contestable Small businesses and households – January 2001	Large industrial customers – already contestable Energy use more than 100,000 GJ/year (approx.$500,000) – December 2000 Remaining customers – September 2001
South Australia	Energy use more than 160MWh/year (approx.$20,000) – already contestable Small businesses and households – January 2003	Energy use more than 10,000 GJ/year (approx.$100,000) – already contestable Non-domestic customers – July 2000
ACT	Energy use more than 160 MWh/year (approx.$15,000) – already contestable Small businesses and households – January 2001	Energy use more than 1000 GJ/year (approx.$10,000) – already contestable Remaining customers – July 2000
Western Australia	Not published	Large industrial customers – already contestable Energy use more than 1000 GJ/year (approx.$10,000) – January 2002 Remaining customers – July 2002
Tasmania	Not published	Not published
Northern Territory	Not published	Not published

*subject to change

'Electrical demand' refers to the *rate* at which electricity is used. This is important because the higher the (maximum) rate of electricity use, the higher the required capacity of wires, transformers and related distribution assets. So to encourage medium and large electricity consumers to control their demand, electricity companies include a demand component in their total charge. Domestic tariffs only include charges for energy (kWh) and a fixed supply charge.

Examples of **new tariff structures** (which can be applied in combination) include:

- *seasonal tariffs* – for example, Western Power (WA) has introduced a tariff which is higher during summer daytime hours and winter mornings and evenings, to reflect the higher cost of supplying peak demand;
- *peak supply charges* – for example, Victorian electricity charges typically include a monthly fee of $5 per kWh of peak annual demand; this means peak demand for 15 minutes of the year determines a component of energy cost for the whole year;
- *'time of use' tariffs* – a higher price is charged per unit of electricity at peak periods, and lower prices during periods of low demand.
- *Green Power electricity tariffs* – a slightly higher price is charged for energy from renewable sources, which has zero greenhouse gas emissions; however, if you choose a *Green Power* option as well as investing in energy efficiency, you can reduce both total energy costs and greenhouse gas emissions. See box page 26.

Negotiating the agreement

1. Assess your requirements

- **Estimate how much electricity you want:**
  Look at the bills from the last 12 months and evaluate your current electricity use and cost in terms of:
  - your highest rate of electricity use during the year (i.e. your peak demand, in kW or kWh)
  - your electricity consumption (kWh) during peak periods (7.00 am to 11.00 pm)
  - your electricity consumption in offpeak periods (all other times)

  Using this data, you can estimate how much electricity your business will be likely to use over the next year. Don't forget to take into account potential energy savings from proposed projects, office fitouts etc.
- **Consider what value-adding services you would like,** and specify them in your negotiations with retailers. For example:
  - *energy management advice* – can a retailer help you use less energy or lower demand?
  - *flexible billing* – do you prefer 7-day, 14-day, 30-day payment terms? Can the retailer offer you predefined billing periods that suit your business?
  - *account management* – what level of service is your business looking for and is the retailer likely to meet your standards?
  - *monitoring* – can a retailer provide you with more information on the pattern of your electricity consumption? For example, a graph of average daily electricity use in each billing period of the previous year; an hourly electricity profile for the past month (where an electricity 'smart meter' is installed).
  - *emergency 24-hour contact*.
- **Consider the type of deal** you want. Key considerations include:
  - do you want to fix *firm prices* for the contract period (risk aversion)?
  - how long do you want the contract to be? Consider a longer agreement period – it can be more attractive to electricity retailers and thus result in lower energy prices. It will also reduce your administrative burden by increasing the time between tendering, while providing a stronger incentive for the electricity supplier to establish automated billing and recording systems.

Contestability can create savings that can be invested in energy efficiency, creating the potential for even more savings.

- if considering a contract longer than a year, *how will prices be escalated in the following years?*

- **Consider purchasing at least some of your electricity as *Green Power*** instead of standard coal-fired electricity. Because *Green Power* comes from renewable energy sources, it's an easy way to achieve an immediate reduction in your greenhouse gas emissions. Most energy suppliers in Australia provide an accredited *Green Power* product, varying in price according to the mix of renewable energy used. You also have the choice of what proportion of your energy use is sourced from *Green Power*. Combine *Green Power* and an energy efficiency program to maximise reductions in both greenhouse gas emissions and energy costs. (See page 26 for more information on *Green Power*.)

2. Request quotations from retailers

Once you have assessed your requirements, you can request quotations from electricity retailers. You can do this yourself or involve a consultant or broker.

- **If you're doing it yourself** – identify prospective retailers and provide them with a structured and concise document giving details on your business, site location, preferred supply period, type of contract you require (i.e. firm, flexibility etc.), value-adding services, load scenarios for the following 12 months.
- A number of companies (**energy consultancies and Internet-based brokers**) offer advice services that allow you to compare energy prices from energy retailers and/or provide free gas or electricity quotes upon request. You may need to provide information on contract options required and site details (operating hours, type of space etc.). A copy of a recent bill will be useful for requested details on your energy use e.g. amount of electricity, amount of last bill, usage pattern on last bill (peak, off-peak).

3. Choose a supplier

Evaluate quotes and decide on the best deal for you.

- Compare the cost and value-added services offered by the various retailers – ensure that there are no hidden costs.
- Focus on key issues, not just price – does the retailer understand your business? Are you likely to get good service from this retailer?
- Meet the retailers of interest to gain a better understanding of their expertise and profile.
- Identify whether further gains are possible and how they can be made.
- Identify ways to improve the deal and find out about any associated risks with prospective options.
- Make sure your contract conditions allow you to reduce the monthly peak demand charge if you can demonstrate that the actual maximum demand has decreased, either by:
  - proving that recent energy efficiency and load management measures have reduced your peak electricity demand, or
  - showing that your maximum demand in the previous year is lower than the contracted value. As electricity suppliers are, in many cases, increasing demand charges while reducing the cost per kilowatt-hour, this is important if you are to gain full financial benefit from greenhouse reduction strategies.

Getting the most out of your contract

Managing electricity consumption and demand will enable you to control all elements of your electricity costs except the fixed charges (e.g. for metering), typically giving you control over more than 95% of the total charge.

- **Monitor energy consumption** to determine the factors contributing to peak demand, and develop strategies

to reduce this through energy efficiency improvement, load management and fuel switching. Strategies which reduce both peak electricity demand and greenhouse gas emissions include:

- improving the efficiency of any equipment that operates at times of peak demand e.g. energy efficient lighting and controls, office equipment (ENERGY STAR-enabled);
- checking any supplementary airconditioning to ensure it is not working harder than it has to – downsize your unit accordingly and consider installing appropriate controls or a more energy efficient unit (see section 4.4 *Supplementary airconditioning*).

- **Set aside a portion of any tariff savings** to be used to reduce office energy consumption and manage demand – put money back into implementing energy efficiency projects. While negotiation of electricity tariffs can result in savings on energy bills of up to 20%, gains in energy efficiency will normally result in further savings of up to 40%. Strategies to manage overall energy use and peak energy demand can also be critical tools in limiting the impact of possible electricity price rises.

Sources

- **Australian Greenhouse Office** 1999 Managing Energy in Local Government (http://www.greenhouse.gov.au/lgmodules/workbook)

  Reproduced in part with permission from the Australian Greenhouse Office.
- **Office of the Regulator-General, Victoria (ORG)** 1998 How do I negotiate a contract? – A guide for 160 MWh/yr electricity customers

Sources

- **Green Power** – http://www.greenpower.com.au
- **The National Electricity Market Management Company (NEMMCO)** has been established to manage the operation of the wholesale electricity market and security of the power system. (http://www.nemmco.com.au/)
- **The Office of the Regulator-General, Victoria (ORG)** is working with sectors of government, customer groups and the electricity industry in planning for the introduction of retail competition to residential and small business customers in Victoria. It has already released an information booklet for large energy-consuming (more than 160 MWh/year) customers. It has also published a guide to negotiating a retail contract and a benchmarking study of the cost of half-hourly metering services, with an associated cost model. Contact the Office at (03) 9651 0222 or see http://www.reggen.vic.gov.au
- **Independent Pricing and Regulatory Tribunal of New South Wales (IPART)** (http://www.ipart.nsw.gov.au)
- **National Electricity Code Administrator Limited (NECA**) (http://www.neca.com.au)
- Many **energy management consultants** offer assistance with load monitoring and energy supply tendering. See www.energysmartallies.com.au
- Examples of **brokers** include: www.energymarket.com.au; www.energyauctions.com.au

3.7 Energy Performance Contracting

Difficulties in financing an energy efficiency upgrade should not deter you from initiating one – consider Energy Performance Contracting and cover your project costs with guaranteed savings.

If you lack capital to fund energy saving initiatives or you are unsure about the returns from an energy efficiency project and want to minimise risk, Energy Performance Contracting provides an attractive and effective solution.

Energy Performance Contracting (EPC) is about guaranteed savings. When equipment or facilities are upgraded to improve energy efficiency under an Energy Performance Contract, the energy savings that result are guaranteed by the contractor for the term of the contract (usually 5–7 years). If the savings fall short, the contractor makes up the difference.

Because the savings are guaranteed, they can be used to pay off the capital cost of the project with very little risk, even over longer payback periods of five, six or even 10 years.

You get the benefits of the upgrades immediately – better comfort or lighting levels, reduced greenhouse gas emissions, often lower maintenance costs – but you use future savings to pay for them. After the project has been paid off, you get to keep all the savings.

Although relatively new to Australia, this financing option is becoming increasingly popular for providing low-risk equipment upgrades.

What's so good about EPC?

- EPC provides guaranteed cost savings and reductions in greenhouse emissions.
- Your infrastructure upgrades pay for themselves.
- One-stop shopping – with a single contract, you can tackle multiple energy efficient projects rather than doing one project at a time.
- Savings projections are reliable.
- The contractor will be motivated to achieve savings.
- Low risk for the tenant.

What can an energy performance contractor do for you?

In one turnkey project, an energy performance contractor can:

- evaluate your energy use;
- identify energy saving opportunities;
- provide engineering design and technical solutions for efficiency upgrades;
- manage the project from design to installation to monitoring;
- facilitate financing, if required;
- train your staff and provide ongoing maintenance services;
- guarantee a specified level of savings.

The project scope is defined by the amount of annual energy and operational savings.

Taking action

Initial steps

To decide if Energy Performance Contracting is a good solution for you:

- Look at your office needs and potential to make improvements. Whether EPC will work for you depends on whether there are enough potential energy saving opportunities to interest a contractor.
- Decide if Energy Performance Contracting is appropriate according to the length of your tenancy in the current premises – make sure the project can be paid off before you leave.
- Speak to others who have implemented Energy Performance Contracts.
- Contact the Australasian Energy Performance Contracting Association (AEPCA) for further information and advice.

- Choose an energy performance contractor. It's important to find an energy performance contractor who can meet your needs and work with you effectively as a partner.

A 'request for proposal' is a good mechanism for briefing potential contractors and comparing their approaches. You could ask for proposals from a select number of potential contractors (contact AEPCA or SEDA for a list of suitable companies), or create a shortlist by first requesting 'expressions of interest'.

The 'request for proposal' defines the general scope of work along with any specific requirements or operational needs that the contract must address, such as minimum lighting levels. Options for financing can be requested if you want the contractor to arrange this.

Selection criteria can then be established which can be used to assess the proposals and choose a 'preferred contractor'.

The detailed proposal

The next step is to reach agreement with the 'preferred contractor' for them to carry out a comprehensive study of your facilities and come up with a detailed proposal.

This proposal will form the basis of the Energy Performance Contract. It should include a description of the specific measures proposed, a full costing, details of the savings to be guaranteed, the protocol for monitoring and verifying savings, and finance if relevant.

Negotiating the Energy Performance Contract

Entering into a performance contract is like forming a long-term partnership. It is important that you remain in close communication with your contractor during negotiations and project implementation.

- Make sure the agreement clearly *defines roles and responsibilities* and addresses issues such as professional liability, arrangements for maintenance and installation, and how guaranteed savings are determined. Get input from your engineering, financial and legal staff.
- Decide on the *length of agreement* acceptable to you (typically 5–7 years to allow the capital improvements to be paid off, possibly less for tenancies).
- *Build contingencies into the contract* for any potential issues you can anticipate (e.g. changes in operating hours). By incorporating responses to likely changes up front, you can avoid contractual problems down the road.
- *Arrange financing*. Raise the capital yourself or a performance contractor can facilitate funding for projects through either leasing or asset purchase schemes.

Follow-up

- Check that all equipment was installed as specified in the contract and confirm that standards for comfort (e.g. light levels) were achieved.
- At specified intervals (every 6 months or every year) the savings are reconciled, and if they don't meet the guaranteed levels, the contractor makes up the difference.
- You and/or the contractor may also identify ways of further improving energy efficiency during the term of the contract – it can be a powerful partnership.

More information

- The **Australasian Energy Performance Contracting Association (AEPCA)** has information and a list of suitable energy performance contractors and consultants. This association was established to act as the peak body representing the Energy Performance Contracting industry in Australia, New Zealand and the South Pacific – to support the commercial growth of members and their market through education, industry promotion, self-regulation and industry standards.

  See **http://www.aepca.asn.au** or contact either the President (Wynne Henderson) on (07) 3228 4514 or the Secretariat (Robert Turner) on (02) 8850 0479.
- Contact SEDA on (02) 9249 6100 or see **http://www.seda.nsw.gov.au**

Seek help if you need it.
Energy consultants can provide this kind of assistance – from assessing the full potential of an EPC for your premises and choosing a contractor, through negotiating the contract, to verifying savings at the end of the monitoring period.

SUCCESS STORY

SEDA'S Energy Smart Government program and performance contracts

SEDA's Energy Smart Government program is driving Energy Performance Contracting as a means of implementing energy upgrades for complexes ranging from commercial offices to hospitals in NSW. Contracts already in place include the State Library of NSW (contractor: Honeywell), Attorney General's Department (20-24 sites, contractor: Tarong) and various Area Health Services (various contractors: Tarong, ECS, Honeywell, AGL).

To date, energy-savings projects have already achieved rates of return of over 20% with a capital investment of around $7,500,000 and annual savings of almost $1,580,000. Reductions in greenhouse gas emissions have so far been estimated at over 12,500 tonnes a year, which is equivalent to taking 2778 cars off the road.

For more information, contact SEDA on (02) 9249 6100 or see http://www.seda.nsw.gov.au

SUCCESS STORY

Lighting retrofit saves 85% of energy costs

Energetics' head office in North Sydney now has one of Australia's most energy efficient lighting installations, thanks to Energy Performance Contracting. The new lighting system was implemented as an Energy Performance Contract with Energy Conservation Systems (ECS), a lighting control company – at no capital cost and a continuous positive cash flow.

What did they do?

ECS removed existing inefficient fluorescent fittings (each containing 4 x 36W halophosphor lamps and 4 x 9W magnetic ballasts) and replaced them with leading edge T5 triphosphor lamps and electronic ballasts. The system incorporates sensors which detect both movement and natural light levels, and allows each fitting to be controlled individually or as a group. This has resulted in an exceptional energy saving of 85% and lighting power has been reduced to less than 6 watts per m^2 with an enhancement of lighting quality.

Annual $ savings	*$4,150*
Cost of investment	*$20,750*
Rate of return	*20%*
Energy savings	*29,170 kWh*
Annual greenhouse gas savings	*27 tonnes CO_2*

Added benefits

- *Reduced airconditioning load, which provides additional savings.*
- *Improved productivity from an improved work environment.*
- *Reduced maintenance costs due to fewer lamps, less running time and longer-life lamps.*

SUCCESS STORY

New lighting system saves $235,000 for Adelaide Mail Exchange

One of Australia Post's larger mail sorting facilities has taken advantage of Energy Performance Contracting to upgrade their lighting without outlaying any initial capital. Occupying five levels and staffed by 600 personnel, offices of the Adelaide Mail exchange have been retrofitted with a new lighting system by Energy Conservation Systems (ECS).

What did they do?

The 24-year-old lighting system was removed and replaced with energy efficient light fittings. Automatic time of day switching, automatic daylight linking and occupancy detection lighting controls were also installed and linked to the Building Management System (BMS).

This has lead to an energy saving of 60% and improved lighting conditions. The capital outlay for the upgrade will be repaid in just over 2 years.

Annual $ savings	*$235,000*
Cost of investment	*$480,000*
Rate of return	*48%*
Energy savings	*4,615,000 kWh*
Annual greenhouse gas savings	*4,300 tonnes CO_2*

Added benefits

- *Reduced airconditioning load, which provides additional savings.*
- *Improved productivity from a better work environment due to improved lighting conditions.*
- *Reduced maintenance costs due to fewer lamps, lower running hours and longer-life lamps.*

SUCCESS STORY

Energy efficient lighting controls at zero cost and 61% savings

Freehill Hollingdale & Page's (now Freehills) office lighting is now controlled by an energy efficient lighting control system. This leading law firm occupies 7 levels in one of Melbourne's most prestigious buildings – 101 Collins Street. It is paying for this new system out of energy savings guaranteed by their energy performance contractor, Energy Conservation Systems (ECS).

What did they do?

ECS installed a time-based lighting control system. Switches were relocated through the tenancy, providing users with more control of their lighting. Individual offices and meeting rooms are controlled by ultrasonic motion detectors that switch off lights when they are vacant.

This has lead to an energy saving of 61% with a payback period of 5 years.

Annual $ savings	*$31,804*
Cost of investment	*$145,000*
Rate of return	*22%*
Energy savings	*309,683 kWh*
Annual greenhouse gas savings	*41.5 tonnes CO_2*

Added benefits

- *Positive cash flow from the day the system was installed.*
- *Improved productivity from an improved work environment due to improved lighting conditions — more control over lighting for occupants.*
- *Reduced maintenance costs due to fewer lamps, lower running hours and longer-life lamps.*

3.8 EnergySmart transport

Your organisation can help reduce greenhouse gas emissions, improve local air quality and reduce traffic congestion by encouraging the use of more 'sustainable' EnergySmart modes of transport.

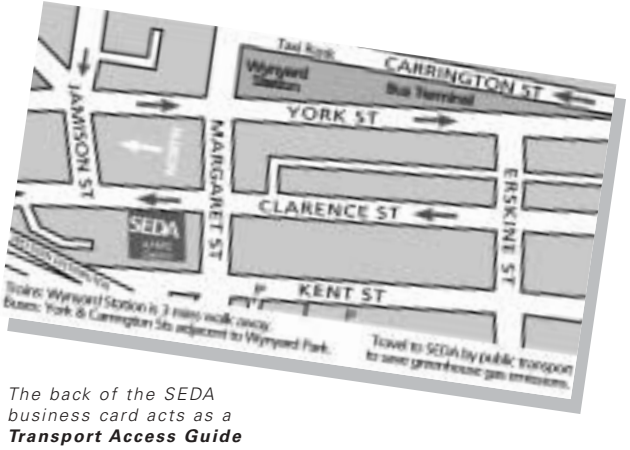
Did you know?

- *The transport sector, through its use of fossil fuels (petrol, oil, diesel and gas), contributes around 25% of Australia's energy-related greenhouse gas emissions.*
- *The most widely used form of transport is the motor vehicle. In fact, the number of motor vehicles in NSW is increasing at a rate higher than the population growth rate.*
- *Cars driven to work in Sydney in 1997 carried an average of 1.1 people each. On this basis, car travel to work generates around 25 kg of CO_2 per 100 km. Bus travel generates around 2 kg per 100 km.*
- *Greenhouse gas emissions from transport are increasing.*

Can you and your organisation take some action to reduce these emissions?

Every person who comes to your premises – staff, clients, customers, couriers, visitors – has travelled by some means of transport, and any form of transport except walking or bicycling generates greenhouse gases. Cars are the most greenhouse-intensive and expensive method of transport, especially when they're carrying just the driver – which is usually the case.

All businesses are 'trip generators'. Reducing the number of trips generated by your business, and particularly reducing the number of trips taken by car, will have a big impact on greenhouse gas emissions. Improving the efficiency of your own transport operations can also save your business money.



The back of the SEDA business card acts as a ***Transport Access Guide***

Simple strategies: transport information for all

A very simple and effective way to reduce the proportion of car travel in the trips generated by your business is to make sure people know how to get to your premises by public transport, cycling or walking.

If you provide clear and relevant information – in the form of a **Transport Access Guide** – people are likely to use it.

This guide can take many forms. It can be as easy as printing a map on the back of your business card. You should include information such as the closest public transport options, the nearest station or bus stop, and the location of secure bike parking. Be specific about distances between your business and public transport. For example, 'two minutes walk from Wynyard station' is better than 'close to Wynyard station'. Think about safe routes to walk to stations or bus stops.

You can also use your Transport Access Guide on invitations, brochures, your web site and any newsletters, recruitment mailings, and mail outs to customers or anyone else that might visit your premises.

Reception and enquiry staff should be familiar with this information, so they can advise callers about easy transport options that don't require car travel.

These staff should also have up-to-date copies of relevant public transport timetables.

Developing a Transport Access Guide can be part of a broader transport greenhouse strategy, but it's something you can do right now. As well as reducing greenhouse emissions, it also enhances your organisation's public image and contributes to good staff and customer relations. Obtain a copy of guidelines to develop your own Transport Access Guide from the SEDA website http://www.seda.nsw.gov.au

Further action

1. Travelling to and from work

Staff trips to and from work may make up the highest percentage of trips generated by your business. Think about ways to encourage staff to use alternative modes of transport so they can reduce greenhouse gas emissions and save money – equivalent to a tax-free payrise.

- **Get out of the car** – at least once a week. Encourage staff to get onto public transport – buses, trains and ferries. And, of course, bikes. Give staff the opportunity to purchase seasonal TravelPasses or tickets by deductions from their salary to save money and fuss in buying tickets.
- **Try carpooling.** Carpooling reduces fossil fuel consumption, saves money – and it's fun. What incentives can your organisation provide to encourage people to carpool? Carpooling is a good option because, for example, drivers who pool with only one extra person, driving a daily round trip of 40 km in a family-sized car, for one day per week throughout the year:
  - reduce vehicle operating costs by about $250 per year.
  - reduce CO_2 emissions by about 470 kg.
- **Encourage active transport.** Active transport such as walking and cycling can protect and improve the physical and mental health of staff and reduce the time lost through sickness. Encourage staff to be physically active by making secure bike parking, showers and clothes storage facilities available.
- **Facilitate telecommuting** (working at home) – even just one day per week can dramatically reduce travel costs. Is this option available to your staff? If not, could it be?

2. Business travel

Businesses buy around half the new cars purchased in Australia and these cars are typically less fuel-efficient than the average car. Look for ways to reduce the fuel consumption of your company cars or the number of trips made.

- Use the phone, fax, email, video conferencing or letter to replace a car trip.
- Choose fuel-efficient cars, which can save 30% of fuel costs and greenhouse gas emissions.
- Restrict CBD parking and don't offer subsidies for parking fees. When relocating offices, consider reduced parking spaces, potentially reducing rental costs.
- Think about public transport access when locating new offices and choosing venues for seminars. Events generate an enormous number of trips to and from the venue. As either a venue or event manager, you can manage these trips to improve accessibility, reduce costs, greenhouse gas emissions and traffic congestion.
- Encourage staff to use public transport when travelling to meetings. They can prepare for the meeting while in transit. Using public transport is also a large money saver, and saves greenhouse gas emissions too. Make reimbursement for public transport easy. Find out what your local bus operator can offer in the way of multiple-trip tickets so you can make them freely available in the office.

The Fuel Consumption Guide website can help you select the most fuel-efficient vehicle for your needs.

www.greenhouse.gov.au/transport/fuelguide

3. Freight management

If you run your own vehicle freight:

- Select fuel-efficient vehicles.
- Optimise their travel routes.
- Make sure the trucks are fully loaded. Empty trucks waste fuel and productive capacity.
- Investigate whether you can purchase or store goods locally, rather than paying extra for transport costs.

If you use freight contractors:

- Avoid using motorised couriers, which are expensive, use lots of fuel and add to traffic congestion. If something is urgent, consider a bike courier instead.
- Ask your freight contractor what actions their company has taken to minimise fuel consumption.

Calculate your savings

How much does it cost for someone to drive to work each day? This calculator can also be used for a fleet of company cars.

The scenario shows that someone who catches public transport instead of driving their car to work and back 5 days a week (a distance of 40 km), could save around $2000 a year. The car's running costs are estimated as 13 cents/km (including petrol, registration, insurance, service etc.)

Days travelled by car to work per week	5 days
Kilometres driven each day (to work and back)	40 km
Vehicle kilometres travelled per year (40 km x 225 days driven per year)	9000 km
Cost of running a car per year = cost per kilometre* x kilometres driven = $0.13 X 9000	$1170
Parking costs (225 days x $10 per day)	$2250
Total costs of a car = running costs + parking costs = $1170 + $2250	$3420
Cost of public transport per year (based on combined weekly bus, ferry and train pass for 42 weeks costing $33 per week) = $33 x 42	$1386
Savings accrued by catching public transport = total costs of a car – cost of public transport = $3420 – $1386	$2034
Estimate of total greenhouse gas emissions saved per year = km travelled x emissions from (car per km – bus per km**) = 9000 x (0.3 – 0.02) kg	2520 kg

* RACV (June 1999) has estimated running costs for various-sized cars as follows:

Engine capacity	Cost per kilometre
1.6 L or less	9.15 – 12.28 cents
1.6-2.6 L	11.28 – 13.15 cents
2.6L or over	11.37 – 12.06 cents

** An average car generates 0.3 kg of CO_2 per km; a bus generates 0.02 kg per person per km.

For more information

NSW

Buses, ferries and trains

- The *Sydney Public Transport Directory* includes detailed maps showing railway lines, stations, bus and ferry routes; as well as contact details for service providers in different areas. This is a good place to start, although some information may be out of date. Available from the NSW Department of Transport, ph 02 9268 2920 or at www.sydneytransport.net.au
- The Integrated Transport Information Site www.131500.com.au and the Transport Info Line ph: 131 500 provide route, fare and timetable information on public transport in and around Sydney, Newcastle, Central Coast, Blue Mountains, South Coast, Southern Highlands and Hunter Region. This site and info line includes rail, bus and ferry services for both public and private operators. The Transport Information Line operates 6 a.m. to 10 p.m., seven days a week.
- The Roads and Traffic Authority (RTA) has published a set of maps of cycle paths in Sydney; for other areas, or to get maps call 1800 06 06 07 or visit www.rta.nsw.gov.au/traffic/o114_c.htm

Cycling

- The Roads and Traffic Authority (RTA) has published a set of maps of cycle paths in Sydney. For other areas, or to get maps call 1800 06 06 07 http://www.rta.nsw.gov.au/traffic/o114_c.htm

ACT

- Local and regional bus service info available at http://www.action.act.gov.au or 13 17 10.
- Regional bus service info available at http://www.deanesbuslines.com.au or (02) 6249 3772.
- Information on cycling including maps, safety, environmental and education issues is at http://www.act.gov.au/services/sport/bicycle

QUEENSLAND

- Queensland Transport is a website offering links to information on public transport in the state http://www.transport.qld.gov.au/public
- TransInfo (13 12 30) is a telephone service and website providing public transport information (buses, ferries and Citytrain) for South East Queensland, from Gympie through to the Gold Coast, including the greater Brisbane area, Ipswich and Toowoomba http://www.transinfo.qld.gov.au/
- Brisbane City Council website gives handy information for getting around the city on public transport. There are bikeway maps for cyclists, general fare and timetable info for trains, buses and City Ferries and much more. http://www.brisbane.qld.gov.au/ You can call the Council for further information on (07) 3403 8888 (24 hours/day).

VICTORIA

- VicTrip is the gateway to information on Victoria's public transport services. You can access details on fares, zones and timetables for metropolitan and country bus, train and tram services. Call 131 638 or look up the website http://www.victrip.com.au/
- Bicycle Victoria provides tips on safe cycling etc. http://www.bv.com.au/

WESTERN AUSTRALIA

- Transperth is a website covering the public transport system of Perth. It includes advice on journey planning and provides timetable, tickets and fares information. http://www.transperth.wa.gov.au/ Call the InfoLine on 13 62 13 or go to any Transperth Infocentre located in Perth Train Station, Wellington Street Bus Station, the City Busport and Plaza Arcade.

SOUTH AUSTRALIA

- Passenger Transport Board (08 8210 1000) has route maps and timetables and information on Adelaide's Metroticket. http://www.ptb.sa.gov.au/
- BikeSouth provides information and advice relating to cycling. You can order eight free Bikedirect maps that cover routes from Gawler in the north to Willunga in the south and from the coast to the hills. http://www.transport.sa.gov.au/bikesouth/index.html

Continued on next page

NORTHERN TERRITORY

- Darwinbus has timetables for bus routes in Darwin.
  http://www.nt.gov.au/dtw/public/bustimes/default.shtml

TASMANIA

- 13 22 01 – call the Metro Bus Service to find out about timetables and tickets for buses in Hobart.

Energy efficient technology

4

Energy efficient technology

Energy efficiency actions can be as easy and cost-free as switching off lights and enabling ENERGY STAR on your computer.

Section 4: Energy efficient technology

4.1 Lighting

Lighting accounts for more than 60% of tenants' energy costs in commercial offices, so significant financial savings can be made.

Using less energy for lighting doesn't mean compromising on performance. More efficient lamps and fittings can deliver the same or better lighting levels as conventional systems. And better lighting control can increase the potential for saving even more. You could reduce your lighting bill by 40-80%!

As well as the benefits of lower costs and greenhouse gas emissions, upgrading your lighting system can have a number of other advantages:

- better-quality light can **increase staff performance** and morale by providing a healthy and pleasant working environment;
- **airconditioning energy costs can be reduced** as more efficient lamps emit less heat;
- **maintenance costs are reduced** because longer-life lamps need replacing less frequently.

How much light do you need?

Different tasks need different amounts of light – called 'illuminance'. Table A shows illuminance levels on the work surface for different activities recommended by Australian Standard 1680.

A lighting technician can check that your lighting meets the levels specified in the standard. Otherwise you can buy a light meter and do regular checks yourself. It's also important to get staff input on any lighting changes to make sure they feel that their individual lighting requirements are being met.

Simple improvements

- **Make the most of what you've got:**
  - Clean light fittings and tubes – dust and dirt build-up can cut light output by up to 30%.
  - Paint your office walls and ceilings with lighter colours to better reflect light and achieve required illuminance without needing as many lights.
  - Arranging desks near windows and trimming vegetation can also help to optimise natural lighting.
- **Switch off lights that are not needed:**
  - Put signs in areas where lights are used infrequently to remind staff (and cleaners) to switch off when leaving – just this simple strategy can save up to 15% of your lighting energy.
  - Make sure you're not 'over-lighting'; if you have standard fluorescent fittings with two 'tubes' (lamps) consider removing one of them.
  - Ask certain people to be responsible for turning lights off to be sure it will be done.

ENERGY SAVING TIP:
Even in a small office (e.g. 130 m²), you can make substantial energy savings of 40% by 'de-lamping' (reducing the number of lamps used in areas that are overlit) and maintenance measures such as replacing tubes and cleaning fittings. The investment can pay for itself in less than a year.

Table A. Recommended lighting levels suggested by Australian Standard for interior lighting (AS 1680.2.2 — 1994)

Activity	*Type*	*Recommended illuminance (lux)*
Typing, reading, writing	*Background*	*160*
	Task	*320*
Computer work	*Keyboard*	*160*
	Reference material	*240–600 (depending on print quality)*
	Background	*160*
Drawing	*Drawing board*	*600*
	Reference material	*320–600 (depending on print quality)*
	Background	*240*
Meeting rooms, training rooms, boardrooms		*240–320*
Photocopy rooms	*General*	*160*
	Collating	*240*

Note that measuring office space by pacing out the area can result in a 20 – 30% error.

Be sure to take an accurate measurement before you implement energy efficiency upgrades.

Further action: upgrading the technology

Conserving energy through your lighting system doesn't have to cost you any money at all. By simply switching off lights whenever they're not needed, you can make huge savings.

However, installing energy efficient lighting technologies and controls can be a valuable investment and the money you spend on equipment is usually repaid in less than a few years.

Since lighting energy depends on the number (and power) of lights installed and the length of their running time, options for savings include:

- choosing **cost-effective energy efficient lighting equipment** (type and number of luminaires);
- selecting the **right control systems** (according to daylight and occupancy).

How efficient is your current lighting system?

To see how efficiently you're using lighting energy, you need to calculate how much lighting power is being used per square metre (m^2) to achieve a given lighting level.

- Measure or 'pace out' an area of your office.
- Determine what kind of energy-consuming lighting technology is being used (what kind of lamps, ballasts, transformers etc.) For safety reasons, don't attempt to touch lamps or fittings; a visual inspection at floor level is enough to determine if, for example, each fluorescent fitting has one or two 'tubes' (referred to as lamps). *Technology table 1* (page 67) gives you an idea of the range of options.
- Check *Technology table 1* to find out the 'wattage' information for each kind of technology you've identified and use this information to calculate the total lighting power in watts. Then divide this figure by the floor area to get the number of watts per square metre.

For example, if a small 78 m^2 office has 20 standard fittings with two standard fluorescent lamps each:

- To work out the total lighting power, the calculation is:
  20 fittings x 2 lamps/ballasts x 45 watts = 1800 watts (including ballast losses)
- To find out how much power per m^2 the calculation is:
  1800 W / 78 m^2 = 23 watts per m^2.

- As the table below shows, needing 23 watts of power per m^2 to maintain a lighting level of 320 lux would be a mediocre result in terms of energy efficiency. An upgrade that didn't compromise light levels but removed one lamp from each fitting would reduce the rate of power use to 11 watts per m^2 – a good result.

Lighting power per m^2 to achieve lighting level of 320 lux	Level of efficiency
25–35	Mediocre
12	Good
4–7	Excellent
2–5 (averaged over time)	State of the art

Source: Managing Energy in Local Government – fact sheets at http://www.greenhouse.gov.au/lgmodules/workbook/. Accessed May 2000

ENERGY SAVING TIP:
If you're unsure about the effect of potential improvements, do a trial in one office or on a single floor to ensure the proposed new system provides what you need in terms of lighting levels and energy efficiency.

Can you upgrade to something more efficient?

Technology table 1 can give you some ideas for upgrading to **more efficient technology** and reducing the watts used per m^2. For example:

- If the lights in your office have two standard fluorescent lamps, consider changing to a single triphosphor T8 lamp and specular ('mirror type') reflector (which can halve energy consumption). It is important, to ensure that the light levels required by Australian Standard AS1680.2.0 are maintained (see table A).
- Combine energy efficient lamps with electronic ballasts to gain added savings.
- Replace incandescent lamps or dichroic lamps with higher efficiency compact fluorescent lamps to save up to 80%.
- Provide energy efficient fluorescent desk lamps for people who need more light (e.g. in areas that are underlit at night).

Technology table 2 outlines **automatic lighting control devices** that can be installed to control existing lights and which should be incorporated into any new lighting system. These can deliver additional savings.

You should also establish **operation, maintenance, and disposal practices**. For example, scheduled group relamping and fixture cleaning (as recommended in Australian Standard 1680.1) can save up to 20% of the cost of 'spot relamping'.

Calculate the savings

The **Lighting Calculator** in the *Tools* section (5.2) can help you evaluate the energy and greenhouse gas savings you could make by upgrading your light fittings energy efficient system. This calculator is also available on the website (www.abgr.com.au) where the calculations are made automatically.

For example, say the small office with standard fluorescent lights described above were to upgrade to fittings with one triphosphor fluorescent lamp and a specular reflector in each fitting, and replace the magnetic ballast with an electronic one. The calculator shows that this would result in savings of more than $400 and 3.7 tonnes of greenhouse gas emissions every year, with the savings paying back the capital cost in less than a year.

Need help?

Consult your **Energy Smart Allies Directory** (http://www.energysmartallies.com/) to find lighting specialists who can help with advice on options and quotations on an appropriate lighting system for your situation.

In addition to cost details, you should request that lighting consultants provide you with estimates of both the energy savings and greenhouse gas emission reductions of the proposed system.

More information

- **US Environmental Protection Agency:** 'Project Kalc' offers free lighting system calculator software — enter existing and upgrade lighting fixture information and the software uses this data to display a financial summary of the proposed upgrade. (http://www.epa.gov/buildings/esbhome/tools/software.html)

  As US units are used, refer to *Units and conversions* in the *Tools* section (5.3) of this handbook to convert to the metric system.

  The agency also offers a manual which is a practical reference for every phase of the lighting upgrade process. (http://www.epa.gov/buildings/esbhome/tools/lighting)
- **The Illuminating Engineering Society of Australia and New Zealand** http://www.iesanznsw.asn.au/
- **Standards Australia:** Information Centre, (02) 9746 4748 – for advice on standard lighting requirements.
- **Some major lamp manufacturers** have showrooms which provide tours and very comprehensive information sessions to the public.

Ask the experts.

Quality advice from lighting engineering consultants can mean quality savings.

SUCCESS STORY

Lighting control system saves 48% of energy costs

With lighting upgrades in their head office in Sydney's CBD, P&O is making significant cost savings, as well as contributing to the greenhouse solution.

What did they do?

Installed a new lighting system on 7 floors (total area 4445 m^2) which incorporates control sensors detecting both occupancy and natural light levels. Lights in offices are turned off when they are vacant and/or receiving sufficient daylight. This has resulted in a halving of energy consumption, with a 3-year payback on the upgrade.

Annual $ savings	*$11,770*
Cost of investment	*$33,800*
Rate of return	*37%*
Energy savings	*103,160 kWh*
Annual greenhouse gas savings	*95 tonnes CO_2 = 21 cars off the road*

Technology table 1

LAMPS

T8 and T5 refer to the diameter of the tube, based on the U.S. system. A T8 is 8/8ths of an inch wide. A T5 is 5/8ths of an inch wide and noticeably narrower.

Standard practice	More efficient practice	Best practice
Fluorescent halophosphor T8 (36 watts)	**Fluorescent triphosphor T8 (36 watts)**	**Fluorescent triphosphor T5 (28 watts)**
Most commercial lighting systems incorporate two standard T8 36W halophosphor fluorescent tubes with a standard magnetic ballast running each tube (see below). Life = 6000hrs	20% greater light output than a standard T8 lamp of the same wattage. The greater light output means fewer lamps are required, resulting in a lower capital cost and lower energy consumption. To maximise these savings, appropriate lighting design is important. Life = 13 000hrs (magnetic ballast) 16 000hrs (electronic ballast)	23% more efficient than a triphosphor T8 lamp and 38% more efficient than standard T8 lamp, i.e. less energy is needed to produce the same amount of light. T5 lamps are most economical when installing new light fixtures, as they require different fittings to T8 lamps. Operate specifically with an electronic T5 ballast. T5 lamps are smaller, therefore fewer resources (such as glass, phosphor and mercury) are used. Shorter than a T8 and so ideally suited to standard 1200mm ceiling tiles. Life = 16 000hrs
Incandescent	**Compact fluorescent lamps (CFLs)**	
These are the most common lamps used for general lighting. They're the least efficient – less than 5% of electricity consumed is actually converted into useful light. Life = 1000hrs	Last 10 to 13 times longer than incandescent lamps and consume about 75% less energy e.g. a 60W incandescent light can be replaced with an 11W CFL. Can provide the same warm coloured light as incandescent lamps. Can be dimmed to 10% of maximum light output (4-pin lamps only). Can usually fit into existing light fittings. Light output is directional–mainly from the sides of the tube, so appropriate fittings and/or reflectors are important for effective lighting. Life = 10 000-13 000 hrs	

BALLASTS

Devices used to control the voltage in fluorescent lamps

Standard practice	More efficient practice	Best practice
Magnetic (9W)	Low-loss magnetic (6W)	Electronic (4W)
Consumes about 10–20% of the input energy to the lamp. Cannot be dimmed. Due to rising minimum standards, magnetic ballasts are to be progressively withdrawn from the market.	Consumes less energy than standard magnetic ballasts. Can simply replace existing magnetic ballasts. Cannot be dimmed.	20% more efficient than magnetic ballasts. Can simply replace existing magnetic ballasts. Have a 50% longer service life than magnetic ballasts. Eliminates flickering. Can be dimmed. Cause the lamp to draw less energy. Improves Power Factor, thereby reducing peak demand charges.

Technology table 1

REFLECTORS
Sit behind lamps in fittings

Standard practice	More efficient practice
Standard	**Specular (mirror) reflector***
Usually white, flat or curved	Usually white, flat or curved. Directs more light downward from the fitting. When retrofitted into existing fitting with a single triphosphor lamp and electronic ballast, energy costs can be cut by up to 50%. Available as a metal fitting and as an adhesive film. The adhesive film requires a little more time to install but is cheaper than the metal reflector.

DOWNLIGHTS
Small lights used for display lighting and areas where direct lighting is needed. Require a transformer and are not generally an efficient option for general lighting purposes, especially when used with a magnetic transformer (see below).

Standard practice	More efficient practice
50-watt low-voltage downlights	**35-watt low-voltage downlights**
Also known as a 'dichroic' lamp. Life = 4000hrs	New design delivers the same light output as a 50-watt lamp but uses only 35 watts. Use internal heat reflection to generate high light output. Light quality as good as a 50 watt lamp. A straight replacement for a 50 watt lamp. Life = 6000hrs

TRANSFORMERS
Convert electricity from 240 volts to a lower voltage

Standard practice	More efficient practice
Magnetic (15–22W)	**Electronic (2–3W)**
Standard practice for low-voltage downlights. Long, narrow and metal	Becoming more widely used since good quality and reliable transformers, made in Australia, are now available. Transformers to which 3 lamps can be connected are also now available. Users report that lamps last longer using the electronic transformer. Relatively simple retrofit for an electrician. Curved, rounded and plastic.

* The shape of the reflector is far more important than the material from which it is made. So, for reflectors of the same shape, specular ones may be only marginally more efficient than standard white reflectors.

Technology table 2

LIGHTING CONTROLS	
Technology	Where can I use it?
Localised switches	In separate work areas e.g. individual offices
Timer controls • A Manual ON control switch and Automatic OFF control that allows lights to be turned off after a set time period • Simple to install and relatively low cost.	In areas which are used for fixed duration activities, e.g. lunchtimes and at the end of the day. A local manual switch should be provided for every 100 m^2 of office space and also for each separate room.
Occupancy sensor controls • Infrared and/or ultrasonic sensors which detect heat or movement, automatically activate lights when someone enters a room and turn them off after a specified period of time. • While infrared sensors are the most common, ultrasonic sensors prove to be more popular as they provide higher savings.	Best used in low-occupancy areas, including meeting rooms, conference rooms, tearooms, bathrooms and storerooms. Sensor must be aligned correctly.
Daylight-linked dimming system on fluorescent lamps • Photocell dimming controls sense levels of natural light and turn lights down or off when sufficient daylight is available. • Dimming also extends life of the lamps. • Electronic ballasts must be used to enable dimming.	Best used near windows to optimise energy savings from natural light.
Reduced voltage system Fluorescent lights require 240-volt supply for the lights to strike (i.e. light up). Thereafter the operating voltage can be reduced with imperceptible effect on lighting level. A reduced voltage system reduces the voltage after startup to a lower level, resulting in energy savings without a noticeable difference in lighting levels. Reduced high voltage systems can often be more cost-effective than installing reflectors and lighting upgrades, especially in short-term tenancies.	On any system of fluorescent lamps in commercial buildings, carparks, etc.

SUCCESS STORIES

State-of-the-art lighting control system cuts energy costs by over 60%

The offices of Energy Efficiency Victoria (now the Sustainable Energy Authority) include one of the most technologically advanced energy efficient office lighting systems in Australia.

What did they do?

Installed a lighting control system which includes timer controls, zone-specific manual override switches, movement and occupancy sensors in all offices and rooms, and pre-set dimming in conference rooms. Managed Lighting System control cubes allow lights to be easily programmed by a hand-held remote control for individual needs – with extensive flexibility and control over switching times, brightness levels, zoning controls and movement. The upgrade also combined the latest in dimmable electronic ballasts and leading-edge T8 triphosphor fluorescent lamps. This has resulted in an energy saving of over 60% and improvement in lighting conditions.

Annual savings	*$8.75/m²*
Cost of investment	*$45/m²*
Payback period	*4.5 years*
Annual greenhouse gas savings	*50 tonnes CO_2 = 11 cars off the road*

Added benefits

- *Improved productivity from improved working conditions.*
- *Reduced maintenance costs due to longer lamp life.*
- *Flexibility to easily fine-tune and modify lighting requirements.*

TNT Australia seizes opportunity to make real savings with lighting controls

TNT Australia has installed lighting controls throughout 11 floors of its Tower 2 in Sydney. Initially the project was to be carried out on one floor only, but potential savings proved so attractive that the upgrade was expanded to include all floors.

What did they do?

- *Installed occupancy sensors in small offices and meeting rooms which switch lights on when staff enter, and off ten minutes after the office is vacated.*
- *Installed a central lighting controller: each floor was divided into several lighting zones with local reset switches in each zone. Lights remain off in unoccupied zones and switch on in each local zone when staff arrive. Reset switches allow staff who are working late to switch lights back on for an hour at a time after the central timer switches lights off in the evening.*

As a result, TNT is saving more than $14,500 annually and helping to reduce greenhouse gas emissions by 138 tonnes each year.

Annual $ savings	*$14,530*
Cost of investment	*$81,400*
Rate of return	*18%*
Energy savings	*143,800 kWh*
Annual greenhouse gas savings	*138 tonnes CO_2 = 31 cars off the road*

76% savings in lighting energy consumption for a Melbourne council

The City of Manningham in the north-eastern suburbs of Melbourne has achieved enormous savings by a suite of improvements in its office lighting system implemented over the last seven years.

What did they do?

- *Installed occupancy-detector switches in individual and open-plan offices, staff lunch room and meeting rooms.*
- *Converted incandescent downlights to use compact fluorescent lamps by installing a ballast and lamp holder.*
- *Replaced existing exterior time switch with daylight sensor.*
- *Installed efficient high-output lamps (triphosphor tubes) and reduced the number of lamps.*
- *Cleaned and replaced diffusers and reflectors.*
- *Used security system to switch off lights automatically when an area is secured for the night.*

This has resulted in an energy saving of 76%, increases in lighting levels, improved lighting colour, and annual greenhouse gas savings of 50 tonnes CO_2.

Added benefits

- *Improved productivity from improved working conditions.*
- *Reduced maintenance costs due to longer lamp life.*
- *Flexibility to easily fine-tune and modify lighting requirements.*

Newcastle City Council enjoys big savings from lighting retrofit

Newcastle City Council has cut lighting energy use by almost half in its administration centre through a lighting retrofit.

What did they do?

Removed existing inefficient fluorescent fittings (each containing 2-tube and 3-tube 40-watt lamps and standard Ferguson ballasts) and replaced them with high-efficiency triphosphor lamps and Gold Label iron core fluorescent ballasts. This has resulted in an energy saving of 47% and improved lighting conditions.

Annual $ savings	*$18,800*
Cost of investment	*$52,000*
Payback period	*2.5 years*
Annual greenhouse gas savings	*350 tonnes CO_2*

Added benefits

- *Reduced airconditioning running costs through reduced heating load.*
- *Improved productivity from an improved work environment.*
- *Reduced maintenance costs due to fewer lamps, lower running hours and longer life lamps (from 2 to 6 years).*

4.2 Office equipment

Computers, monitors, photocopiers, printers and fax machines

Office equipment accounts for approximately 20% of electricity used in the commercial sector and costs Australian businesses around $250 million each year to run – equivalent to 2 million tonnes of greenhouse gas emissions annually.

Simply by purchasing energy efficient office equipment and running it wisely, significant cost and greenhouse savings can be made.

Other benefits include:

- a **reduction in office noise level** when the equipment powers down when not in use.
- less heat is produced, contributing to a **cooler and more comfortable workspace** and a **reduction in airconditioning costs.**
- equipment has an **extended life** and offers **decreased maintenance – further savings.**

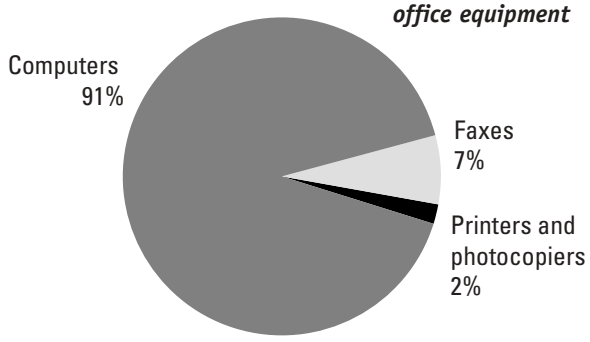
Simple improvements

- **Enable** ENERGY STAR on existing equipment:
  - **computers** – use the simple guide to enabling ENERGY STAR on your PC at http://www.energystar.gov.au or talk to your IT manager about enabling the power-saving feature on PCs throughout the organisation. Consider password-protecting the ENERGY STAR control menu so it can't be disabled.
  - **photocopiers, fax machines** and printers – ask your maintenance person to enable ENERGY STAR.
- **Turn off your computer** when it's not in use, especially overnight and on weekends. If you can't turn it off, at least switch off the monitor. Post signs in your offices to encourage staff to turn off computers.
- **Switch off equipment** at power point when not in use (especially for long time periods) – office equipment can still use energy and cost you money when switched off at the appliance but not at the power point.
- **Fit timer switches** to photocopiers.
- **Photocopy in large batches** – saves energy used when going in and out of standby mode and decreases time the copier spends in high-powered mode.
- **Use double-sided photocopying and printing** – saves paper costs as well as the energy needed to make the paper. (See also page 75.)
- **Use remanufactured or refillable toner cartridges** wherever possible – reduces waste going to landfill and energy used in their production, while saving you money (up to $100 each time they're re-used).

Energy efficient office equipment can use half as much energy as standard models — at no or little additional capital cost.

Computers are by far the largest energy consumers among your office equipment.

Energy use by office equipment

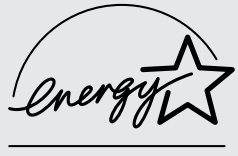


ENERGY STAR office equipment

ENERGY STAR is an international energy efficiency standard for office electrical equipment. By selecting ENERGY STAR office equipment (computers, printers, fax machines, scanners and photocopiers) you can reduce greenhouse gas emissions and your electricity bill by more than half.

ENERGY STAR office equipment automatically switches itself into a power-saving 'sleep' mode after a designated amount of idle time, reducing the amount of energy it uses. You can easily adjust the time it takes for the machine to 'go to sleep' to suit the way you work. Computers can be reactivated when needed by simply moving the mouse or touching the keyboard.

This logo indicates your office equipment can save you energy and money. The ENERGY STAR feature on labelled equipment must be enabled to generate savings.



Further action

1. **Implement** a purchasing policy to ensure your organisation only purchases ENERGY STAR equipment (see the *Procurement tips* on page 76). Make sure you specify that the ENERGY STAR feature is to be enabled upon delivery. A list of ENERGY STAR manufacturing and retail partners is available at the ENERGY STAR website (http://www.energystar.gov.au).
2. **Educate** employees about the benefits of ENERGY STAR equipment. Energy savings from ENERGY STAR compliant equipment won't be achieved if you don't make use of the energy saving features. Negotiate with staff to come up with a convenient time delay before the power-down activates.

*If ENERGY STAR cannot be enabled (e.g. for Windows NT4 Workstation users), you can now purchase an alternative energy-saving software product – **Energy Management Option EMO™** – which can switch off your computer when not in use (after saving all open data files, closing all applications and the operating system).*

Fujitsu's Energy Management Option (EMO™) is an innovative and unique software solution that will deliver significant, auditable greenhouse gas emission reductions and energy savings. EMO™ delivers these savings through powering off desktop computers that are left on unnecessarily. Typically, this is required after hours and on weekends.

EMO™ also works well in conjunction with ENERGY STAR: once EMO™ software is installed, individual users may not be able to disable ENERGY STAR features. Therefore, EMO™ is a useful tool to help you set a business policy for enabling ENERGY STAR features on individual PCs or groups of computers.

The software provides calculations on energy, cost and CO_2 savings – useful details to include in your business's energy audits and reports. The package is also self-funding i.e. the price you pay for it is based on the potential savings it would make for your business.

For more information and purchasing details, contact Charles Hatchman at Energy Management Solutions - (03) 9569 7466
emo@fast.fujitsu.com.au** or **www.emo.com.au

The savings power of ENERGY STAR

Four powerful success stories show the potential of this very simple action.

Organisation	ENERGY STAR enabled on:	Annual cost savings ($)	Energy savings (kWh)	CO_2 saved (tonnes)
Blackmores Ltd	72 PC monitors	$2,234	23,000	21
Riverina Eastern Regional Organisation of Councils (REROC)	80 PC monitors	$1,674	22,000	20
Fairfield Council	400 PCs, 7 printers and 10 faxes	$7,828	129,000	120
Pinpoint Pty Ltd (see page 78 for the full success story)	360 PC monitors + incorporated ENERGY STAR in purchasing policy	$7,200	73, 600	67

Tips for energy efficient purchasing

When buying computers, printers, faxes and copiers, it is important to consider:

- ENERGY STAR features *(see ENERGY STAR procurement tips for your purchasing policy, page 76)*
- energy efficient alternatives e.g. laptops instead of desktop PCs
- equipment that can be networked throughout the office
- multi-purpose fax/printer/copier scanner units (great for small offices)
- photocopiers with low energy standby and rapid start from cold features
- easy-to-use double-siding capacity
- equipment that can take recycled paper without voiding any warranty
- user-friendly power management controls

See section 3.5 *Buying new equipment* in this handbook for advice on incorporating energy efficiency into your organisation's purchasing procedures.

Calculate your savings

Use the ENERGY STAR cost saving and environmental impact calculator to calculate how much energy can be saved by using ENERGY STAR equipment. The calculator is available at http://www.energystar.gov.au/sc02/index.html#calculator

You can estimate energy consumption of an individual item of office equipment using a plug-in meter purchased from most electronic stores (costing about $600). Alternatively, ask suppliers for information on consumption (during operation as well as on standby).

More information

Energy Star National website (Australia) has information on how to enable ENERGY STAR, purchasing tips, technical specifications, the cost saving environmental impact calculator, ENERGY STAR program and links to other related sites.
http://www.energystar.gov.au

It is a popular misconception that screen savers save energy — they don't! When the screen saver is running, your PC could still be consuming the same amount of energy as when you are using it.

SUCCESS STORY

Photocopier energy use cut by inexpensive timer

The Office of Energy Policy, South Australia, purchased a $40 timer for its central photocopier after it was calculated that the copier consumed most of its energy on standby. The timer turns the unit on for 10 working hours on weekdays but can be easily overridden if the copier is needed outside normal operating hours. Energy savings repaid the cost of the timer within three months. It is estimated that over a tonne of greenhouse gas emissions are saved annually.

(Source: 'Saving Energy in the Office', in Energy South Australia *Oct 1996, newsletter of the Office of Energy Policy, South Australia, Adelaide)*

Office paper use

Each year Australian offices consume around 400,000 tonnes of paper, which took 16,000 GWh of energy to produce.

If you consider that it takes 10 times more energy to manufacture a piece of paper than it does to copy an image onto it, you can make a significant difference by using paper more efficiently. Less paper also means cost savings for your office.

Taking action

Reduce

- *Make double-sided photocopies and printouts wherever possible e.g. set shared photocopiers to a default setting for double-siding.*
- *Use paperless alternatives such as email, fax-modems.*
- *Use reduction facilities on photocopiers to maximise the amount of information on each page.*

Reuse

- *Circulate memos and bulletins on communal noticeboards.*
- *Reuse paper printed on one side (create a paper reuse tray for the collection of suitable paper).*
- *Use stapled scrap paper for message pads.*
- *Reuse internal mail envelopes.*

Recycle

- *Use recycled paper as much as possible (recycling paper requires at least 50% less energy, and up to 75% less water than making it from virgin fibre; it also produces up to 90% less aqueous effluent and reduces the amount of waste going to landfill).*
- *Implement a formal paper recycling scheme in the office (e.g. place recycling boxes next to photocopiers and printers).*

More information

Down-to-earth Officecare — A practical guide to environmental action in the office (1997). *Fuji Xerox Australia Pty Ltd.*

ENERGY STAR procurement tips for your purchasing policy

As a general guide, manufacturers and purchasers should ensure that all products are shipped with the ENERGY STAR low-power feature activated or enabled and tested. (This eliminates the need for users to configure the power management feature after delivery, and helps ensure that the energy-saving feature is used). The low-power mode specifications for ENERGY STAR office equipment are summarised below.

ENERGY STAR computers and monitors

The vendor must:

- Configure personal computers such that they automatically enter a low-power mode of 30 watts or less after a period of 15 minutes of inactivity. (Where the PC and the monitor are in the same casing, the system must enter a low-power mode of no more than 60 watts after a period of 15 minutes of inactivity.)
- Configure PCs such that they switch connected ENERGY STAR monitors into a low-power mode after a period of 15 minutes of inactivity. (Most monitors cannot enter low-power mode by themselves but rely on an external trigger. This is normally provided through a signalling protocol called Display Power Management Signalling or DPMS. Both the PC and monitor must be DPMS compatible for this system to function.)
- Ensure that monitors meet the US EPA's ENERGY STAR specifications and are Display Power Management Signalling (DPMS) compatible. (Monitors must be able to enter a low-power mode of 15 watts or less when connected to a correctly configured PC.)
- Ensure that the PC is compatible with [name of your network system] and does not disconnect from this network while in low power mode. (Many manufacturers test their ENERGY STAR equipment on networks and can report, for example, that they are compatible with Novell NetWare, Banyan Vines, Windows NT, LAN Manager and other network systems.)

ENERGY STAR printers and fax machines

The vendor must provide printers that meet ENERGY STAR specifications as set out below:

Print engine speed (pages per minute)	Average watts in low-power mode	Printer default time	Fax default time
0 < ppm < 7	<15 watts	15 minutes	5 minutes
7 < ppm < 14	<30 watts	30 minutes	5 minutes
14 ppm & high-end colour	<45 watts	60 minutes	15 minutes

ENERGY STAR photocopiers

The vendor must provide photocopiers that meet ENERGY STAR specifications as set out below

Standard format				
Copier speed (copies per min)	Low-power mode (watts)	Low-power default time	Off mode (watts)	Off mode default time (min)
0 < cpm ≤ 20	None	NA	≤ 5	≤ 30
20 < cpm ≤ 44	3.85 x cpm + 5	15	≤ 15	≤ 60
44 < cpm	3.85 x cpm + 5	15	≤ 20	≤ 90
Large format				
Copier speed (copies per min)	Low-power mode (watts)	Low-power default time	Off mode (watts)	Off mode default time (min)
0 < cpm ≤ 40	NA	NA	≤ 20	≤ 30
40 < cpm	NA	NA	≤ 40	≤ 90

Technology table 3

Equipment	Benefits
Computers (biggest savings) The average PC will consume 610 kWh of electricity per year and draws between 110 and 150 watts when active. ENERGY STAR can power down the computer (including the hard drive and the central processing unit) to 30 watts or less. Monitors can account for two-thirds or more of the energy consumption of a typical computer and monitor combination. Therefore huge savings can be made by enabling ENERGY STAR just on monitors. When ENERGY STAR is activated, the screen will go blank – this may seem similar to a screen saver, but screen savers do not save energy. Even if ENERGY STAR cannot be enabled, the monitor should be switched off when not in use. Buy the smallest, most energy efficient monitor that will suit your needs – a 14" monitor uses 35% less power than a 17" monitor. Consider buying a portable/laptop computer; they use less energy and are less greenhouse-intensive than desktop models. Don't forget: even if you can't enable ENERGY STAR (e.g. if you are running Windows NT4 Workstation) you can still save power by switching off the computer when not in use. At the very least, turn off your monitor.	Save approximately $36–$50 per computer per year in electricity bills (no additional capital cost is required). Added benefits where ENERGY STAR is enabled: • more comfortable workplace as heat released by computers can be up to 25% less. • Reduction in airconditioning costs, due to less heat being generated. • Reduction in noise level as equipment powers down when not in use.
Printers and faxes ENERGY STAR will automatically switch the printer or fax into a power-saving 'sleep' mode after a specified amount of idle time. The power consumed during the sleep mode will depend on the size and capacity of the machine – between 15 and 45 watts. Fax machines are often left on continually, but their actual use time is about 1 hour per day. Share a printer with other people in the office. Many ENERGY STAR labelled fax machines can scan double-sided pages. This reduces both copying and paper costs. Consider buying inkjet printers and faxes over laser models; they use as much as 95% less energy and are often cheaper to buy.	Save approximately $40 per unit per year in electricity bills.
Photocopiers ENERGY STAR labelled photocopiers are equipped with a feature that allows them to automatically turn off after a period of inactivity, reducing the copier's annual electricity costs by over 60%. Buy a copier that's an appropriate size for your needs, with user-friendly controls. Photocopiers can be preset to double-siding, resulting in a reduction in paper costs. When not in use, remember you need to close the copier's lid for the energy-saving mode to function.	Save up to $100 per unit per year.
Multifunction machines ENERGY STAR multifunction machines (combined printer, fax, scanner, copier) power down to 30–200 watts in 'sleep' mode after 15–120 minutes, depending on equipment speed.	Save up to $45 per unit per year in running costs

SUCCESS STORIES

Pinpoint – simple savings at no extra cost

Pinpoint, a Sydney-based marketing company that manages card loyalty programs for companies such as Telstra and Visa, is set to save big dollars every year on their office equipment at no extra cost to themselves.

What did they do?

Enabled ENERGY STAR on 360 computer monitors. In addition, Pinpoint has instigated a purchasing policy to ensure that all office equipment purchased in the future will have ENERGY STAR features.

Annual $ savings	*$7,200*
Cost of investment	*$0*
Rate of return	*N/A*
Energy savings	*73,611 kWh*
Annual greenhouse gas savings	*67 tonnes CO_2 = 15 cars off the road*

Added benefits

- *Reduction in office noise level as the equipment powers down when not in use.*
- *Equipment will last longer and require less maintenance.*

City of Adelaide – set to achieve $30,000 annual savings with ENERGY STAR

As part of their Environmental Management Plan and commitment to the Cities for Climate Protection™ program, the City of Adelaide has introduced a key initiative for using energy efficient (ENERGY STAR) office equipment. With no additional costs incurred, this council is making big environmental and financial strides forward with energy efficiency.

What did they do?

- *Enabled ENERGY STAR on 500 computers, 45 photocopiers and 30 printers.*
- *Amended their purchasing policy to require compliance of office equipment with current ENERGY STAR specifications.*
- *Raised staff awareness of the need to switch off computers when they leave for the day.*

Annual $ savings	*$21,721 (computers)* *$9,718 (photocopiers & printers)*
Total annual $ savings	*$31,439*
Cost of investment	*$0*
Rate of return	*N/A*
Energy savings	*228,898 kWh*
Annual greenhouse gas savings	*200 tonnes CO_2 = 44 cars off the road*

Added benefits

- *Resultant financial savings can be reinvested in further energy efficiency initiatives.*
- *Equipment will last longer and require less maintenance.*
- *Reduction in office noise level as the equipment powers down when not in use.*

4.3 Other equipment

Boiling water units, urns, refrigerators, microwave ovens, vending machines

You'd be surprised how much energy you can save in your staff rooms and kitchenettes.

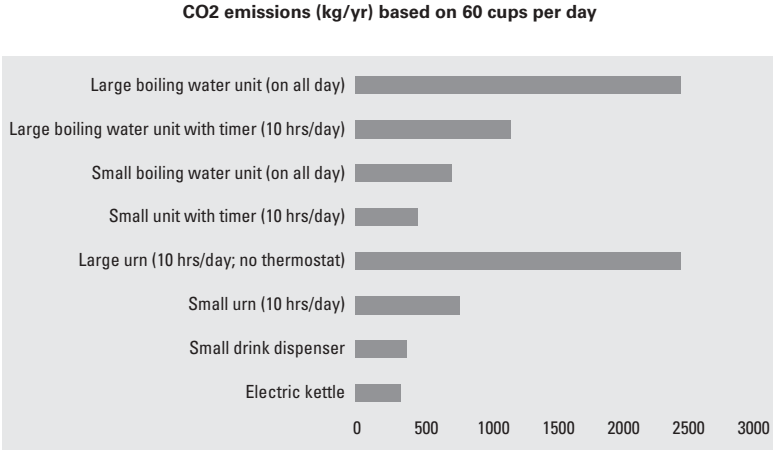
While only accounting for around 2% of energy consumed in your office, boiling water units, fridges and other equipment need to be considered. Refrigeration alone costs the commercial sector up to $200 million each year and accounts for around 2.3 million tonnes of greenhouse gas emissions annually.

By changing your office practices, evaluating your needs carefully and choosing the right models, you can make significant savings in your staff rooms and kitchenettes. Simply using smaller energy efficient alternatives for boiling water units can make a difference.

Simple improvements

- Large hot water boilers can use as much electricity as 10 desktop computers (2500 kWh annually), costing $375 a year to run and generating 2.5 tonnes of CO_2. Consider more efficient alternatives (see graph).
- Fit timer controls to switch off boiling water units when not needed; consider a seven-day timer so it can be switched off over the weekend.

A comparison of types of water boilers and their greenhouse gas emissions (adapted from EEPB 1994)



Possibilities include:

- plug-in timers available from hardware stores for plug-in units;
- a timer supplied and installed by an electrician for permanently wired units.

- A fridge can use around the same amount of electricity as a photocopier (up to 800 kWh annually). Locate the fridge in a cool spot, out of the sun; this can save up to 100 kg CO_2 each year. Ensure ventilation is provided over coils and around the cabinet. Ensure door seals are clean and the door closes properly – save up to 50 kg CO_2 each year. And set the temperature at around 4°C (for every degree lower than this, the energy consumption increases by 5%).
- Only run a dishwasher with a full load.
- Avoid water wastage – each litre of boiling water wasted costs a cent and generates a tenth of a kilogram of greenhouse gases.
- Repair dripping taps – they waste energy and water (up to 100 kg CO_2 a year).
- Insulate around hot water pipes to avoid heat loss.
- Minimise the number of drink vending machines and cold water dispensers (each can consume 3000 kWh per year, costing you $300 in electricity). Put them on timer controls e.g. a simple plug-in time-switch costs around $20, or switch them off at night – if they don't contain perishable goods.
- Delamp vending machines permanently to save energy without affecting the product.

Further action

Boiling water units:

- Install low standby-loss boiling water units (preferably less than 50 watts loss – manufacturers can give details).
- Most units are oversized. Select a smaller unit – a 5-litre model is often more than adequate and cost much less to buy and run than larger units.
- Consider alternatives – electric kettles and small drink dispensers are more cost-effective and energy efficient.

Refrigerators and dishwashers:

- Choose smallest size required e.g. bar fridge is very energy efficient.
- Select model with a good Energy Rating Label – the more stars, the more efficient it is and the lower the running costs (choosing a 5-star single-door fridge over a 2-star model could save you over $300 in energy cost over 10 years). See http:// www.energyrating.gov.au for a list of all models on the market.
- Choose most energy efficient and water efficient dishwasher (5 or 6 star-rating).

More information

- **Energy labelling:**
  http://www.energyrating.gov.au
  This interactive site lists all energy rated electrical appliances registered in Australia and tips for selecting the most efficient models. It covers dishwashers, fridges and freezers, room airconditioners and other appliances.
- **Australian Institute of Refrigeration, Airconditioning, and Heating (AIRAH):**
  Great starting point for anyone interested in finding out more about refrigeration.

Appliance energy labelling

Introduced in 1986, the Energy Rating Label lets you easily compare the energy efficiency of domestic appliances and make informed choices about the products you buy. It also provides incentive for manufacturers to improve the energy performance of appliances. The scheme is now mandatory in most states and territories, for refrigerators, freezers, clothes washers, clothes dryers, dishwashers and airconditioners (less than 7.5 kW output cooling capacity). These products must carry an energy label when they are offered for sale.

The Energy Rating Label has two main features:

- ***THE STARS*** *– the star rating (on a scale of 1 to 6) gives a quick comparative assessment of the model's energy efficiency.*
- ***THE RED BOX*** *– indicative energy consumption (kWh/year) provides a better indication of what the annual energy consumption of the appliance is likely to be.*

The Star Rating is determined from the energy consumption measured under Australian Standards. Appliances must meet minimum performance criteria before they can be granted an Energy Rating Label.

The new energy label

It is only slightly different from the old label. One thing to note is that the star ratings for all products have been revised for the new label – meaning that equipment is becoming more efficient.

4.4 Supplementary airconditioning

If you need extra cooling, you can save between 20% and 70% of airconditioning operating costs by using and maintaining your system effectively.

Supplementary airconditioning units are commonly used in commercial offices where extra cooling is required on top of that provided by the base building heating, ventilation and airconditioning system (HVAC). They are often installed in areas of high occupancy, such as call centres, conference and meeting rooms, as well as computer rooms and for after-hours use.

The key to saving energy lies in sizing, installing, maintaining, and using the airconditioning system correctly. It is important to choose the correct technology and type of system for your business's application. Since heating and cooling are major contributors to peak demand for energy, they contribute disproportionately to energy bills, which increasingly includes extra charges for high peak demand. This means great savings can be made by increasing the unit's efficiency. Other benefits include better working conditions and health for occupants.

Computer room airconditioning can generate a third or more of the greenhouse gas emissions associated with mainframe computers.

Simple improvements

- Ensure thermostats are not located near heat sources such as photocopiers, natural sunlight or space heaters.
- Regularly clean or replace filters.
- Control on/off times to avoid unit running unnecessarily.
- Alter thermostat set points up and down by one degree in summer and winter respectively.
- Install glazing/tinting or blinds on windows to minimise heat gain from the sun.

Further action

1. Assess your existing system

Do you need it?

- If you have a central computer room with special airconditioning, consider options for shutting it down — almost all modern computers can operate in a normal office environment, avoiding the need for separate airconditioning systems which can often consume more energy than the computers themselves. See the success story on page 83, *Computer room shutdown generates big savings*. Consider updating your computers to modern models with reduced energy requirements.
- Airconditioning systems may be used when it might be just as effective to open windows and doors. However, in many buildings, it is impractical to do so. If this is the case:

Can you turn down the heat?

- Reduce the heat load by turning off all unnecessary lighting in the airconditioned area. Installation of energy efficient lights and delamping (i.e. reducing number of tubes in light fittings) will produce less heat and save energy costs.
- Ensure your office equipment is ENERGY STAR-enabled; this will reduce the amount of excess heat emitted (see section 3.2).
- Reduce the amount of excess solar heat that enters the space. For example by using overhangs on a north-facing façade, or double-glazing/tinting on windows.
- Reduce heat loss/gain by insulating ducts, pipes, wall and roof spaces. This can save up to 40% of your energy costs.

- Insulating a computer room's walls, floor and ceiling reduces cooling loads imposed by surrounding areas.
- Minimising heat loads reduces the size of the system needed for cooling, as well as the running costs and peak demand charges.

Look at minimum air levels:

- Outside air is used in most airconditioning systems to control air quality (e.g. to remove odours and CO_2). However, it is important to ensure that excess outside air is not used as this can increase the amount of heating or cooling required. This means outside air flow rates should match what is actually required, based on floor area and occupancy level. Modern control systems allow the ventilation rate to be varied with building occupancy. The minimum outdoor air supply is often set at 1 litre/second/square metre. This can be reduced where there is low occupancy or highly filtered air. Expert advice should be sought in this regard.

Check the performance of the system:

- Performance of airconditioning equipment often deteriorates over time. Therefore, thorough maintenance programs can bring substantial, cost-effective savings. A sample of nine office buildings in Sydney that implemented such maintenance programs, achieved median energy savings of 23%. The ongoing annual cost of the maintenance program was typically around 15 per cent of the ongoing annual energy savings.
- Clean coils, fins and filters and replace filters in airconditioners regularly. Clogged, dirty filters block normal air flow and reduce a system's efficiency significantly.
- Check for air leaks. Ensure no air is leaking from air ducts. Test for air leaks in ducts by listening, visually inspecting damage, or by brushing soapy water across joints and watching for bubbles.
- Seal air leaks around doors and windows.
- Insulate air ducts and pipes to reduce excess heated or cooled air being lost.
- Check for a rise or drop in temperature in ducts and pipes by measuring the temperature at both the beginning and end of pipe runs. If there is a significant temperature change, upgrade insulation, especially if pipes are exposed to the outdoors or enclosed in a roof space that gets hot.
- Make sure maintenance programs include regular checks of thermostat calibration, sensors and controllers to ensure they are operating correctly.

2. Install controls

Controls monitor the heating and cooling requirements of the office and vary the operation of the supplementary airconditioning system to maintain comfort. Seek expert advice to investigate options according to your office needs.

Timer controls

- Supplementary airconditioners can be operated by a manual time switch which can turn the unit on and off as required. This is particularly useful for conference rooms or boardrooms that are only occupied at certain times. Set timer controls to ensure that the unit is not left on after the room has been vacated.

Temperature controls

- Increase your thermostat set point by 1 to 2°C in warm weather, and decrease it in cool weather. For a minimal temperature change, large energy savings are possible whilst still maintaining comfort.
- Temperature sensors are available to control the unit's operation according to thermal requirements and occupancy levels.
- Chilled water or evaporator temperature controls can be increased in cooler weather, reducing energy costs due to the improvement in refrigeration efficiency.

3. Install a new system

The unit you select for your conference or computer room is often limited by the type of centralised airconditioning system installed in the base building. There are different types of supplementary airconditioning equipment with varying efficiency levels. Packaged and fan coil units are the most widely used in commercial offices. See *Technology table 4* for more information.

When designing your office, first check whether you actually need a computer room with separate airconditioning – contact the manufacturer of your computers to find out what range of temperatures and humidity the equipment can operate in.

If you do decide to proceed, use the box on the next page – *Things to consider when installing a new system* – to help you make the right choices.

Calculate your savings

Complete the 'Heating and Cooling Survey' at US EPA website *Heating and Cooling System Upgrades* http://www.epa.gov/appdstar/buildings/man al/index.html

As US units are used, refer to *Units and conversions* in the *Tools* section of this handbook (5.3) to convert to the metric system.

More information

- **Australian Institute of Refrigeration, Airconditioning, and Heating (AIRAH):** Great starting point for anyone interested in finding out more about HVAC systems. http://www.airah.org.au
- **Energy Managers Association of NSW:** http://www.emansw.asn.au
- **Energy Labelling:** www.energyrating.gov.au

SUCCESS STORY

Computer room shutdown generates big savings

A Commonwealth department, occupying two floors of a city building, closed its computer centre, after realising the rapid growth of the desktop machines distributed around the office was meeting office use requirements and the centre was no longer needed. Electricity consumption for the entire tenancy was cut by 43%.

By removing the computer room airconditioners and reinstating the normal office airconditioning ducting, annual airconditioning maintenance costs were reduced by $5,400 and electricity costs by $10,100. Since the capital cost of the initiative amounted to only $8,150 (a return of 190% per year), this investment paid for itself in less than a year.

(Source: Australian Greenhouse Office (1999) Managing Energy in Local Government, *Victoria)*

Things to consider when installing a new system

Get informed

- *Ask the building manager about the base building airconditioning system and what options there are for installing supplementary airconditioning units in your premises.*
- *Discuss opportunities for supplementary airconditioning with the building owner during lease negotiations and the fitout design for your office – to ensure that your plans comply with lease requirements and fitout guidelines.*
- *Seek professional advice regarding applicability, costs, appropriate design and size of the unit according to the base building system and your needs. Your airconditioning contractor or supplier, consulting engineers, energy auditors and energy management specialists can help you select the best equipment.*
- *Remember to stipulate that you want the most energy efficient unit for your needs. A generic specification prepared by a consultant can influence type of equipment purchased from suppliers and how it can be used more efficiently.*
- *Avoid making your decision solely on the basis of price. The quality of the installation should be your highest priority, because quality will determine lifetime energy cost, comfort and durability.*

Look for energy efficient performance

The higher the Coefficient of Performance (COP) of the system, the more energy efficient the system is, and the greater your savings. For room and split-system airconditioners, check the star rating (the more stars, the better); see http://www.energyrating.gov.au for a list of all models on the market.

Consider size

It's important to purchase the right size airconditioner because buying one that's too big can penalise you in a number of ways:

- *It costs more, both in capital costs and energy costs (i.e. it uses more electricity) to buy a larger system than you need.*
- *The larger-than-necessary system cycles on and off more frequently, reducing its efficiency. This makes indoor temperatures fluctuate more, results in a less comfortable environment and wears out the compressor and electrical parts more rapidly.*
- *It is important to choose equipment that will fit into an office ceiling space, on a wall or floor space, and allow sufficient room to be serviced and maintained.*

Consider location

It's crucial to select the most appropriate position for the unit to:

- *allow easy access – for regular (e.g. monthly) maintenance and service or repair*
- *minimise noise – airconditioners can often be noisy and should be installed outside the serviced area (i.e. conference room) in a position of sufficient sound insulation e.g. in a ceiling or wall space.*

Ensure proper installation

Faulty installation of your airconditioner can result in leaky ducts and low air flow. As a result, modern energy efficient airconditioners can perform almost as poorly as older inefficient models.

Ensure regular maintenance

Make sure your airconditioner's filters, coils, and fins are maintained each month by an independent service company. Have the airflows checked, and get airflows adjusted each year as required. Where applicable, also make certain that the building manager is providing the coolest and cleanest chilled or condenser water through the centralised system, as dirty water reduces system efficiency.

Technology table 4

Types of airconditioning systems

The size of airconditioning equipment is measured in terms of kilowatts of refrigeration (kWr).

TYPE	COP*	Key efficiency points	Application
Room airconditioners	2–2.5	Least efficient unit. Low capital cost. Not very common. Look for the highest number of stars available on the product's energy label (for equipment under 7.5 kWr).	When only a few rooms need to be airconditioned. Installed in a wall or window of a room to deliver conditioned air without ducts.
Split-system airconditioners	2.5–2.8	Not energy efficient. Relatively low capital cost. Look for the highest number of stars available (for equipment under 7.5 kWr).	The compressor is housed in a separate unit outdoors – often impractical for offices in large highrise commercial buildings.
Packaged units (water-cooled)	2.5–5.5	Commonly used for computer rooms. Efficiency of the system is improved if the building has an outside air heat exchanger (recovers and utilises energy that would ordinarily be wasted). Reverse-cycle packaged units (i.e. contain a heat recovery system) are also highly efficient (COP 4.5) and cost-effective.	Where the building has a condenser water system or a secondary condenser water system.
Fan coil units	3.8–6.5	Most efficient. Runs on chilled water. Comparable capital cost with packaged units. Efficiency of the system is improved if the building has an outside air heat exchanger.	Where there is a chilled water system in the building.

* COP (Coefficient of Performance) = cooling or heating output capacity/ electrical power input. The higher the COP, the more energy efficient the system is and the greater the savings.

5 Tools

Tools

Create staff education materials, calculate your energy savings and search for more information on related websites.

Section 5: Tools

5.1 Resources for an energy management program

GREEN GAZETTE

TENANT ENVIRONMENTAL NEWS
NOVEMBER - DECEMBER 2000

Easy ways to save energy at home! Cool it this summer

Beating the summer heat doesn't necessarily mean having the airconditioning on full blast. You may stay cool but your electricity bill will show the damage – and you'll also generate harmful greenhouse gases, which are thought to cause global warming.

Here are a few tips on how to reduce harmful greenhouse gases and save money whilst staying cool this summer :

- Install ceiling sweep fans, or use portable fans. Fans improve comfort levels, even in airconditioned rooms, and generate less than a kilogram of greenhouse gas every ten hours.
- Buy energy efficient equipment. Look for the star rating when choosing electrical equipment. The more stars – the more energy efficient it is.
- Only cool what you need to. The smaller the area cooled, the less greenhouse gas generated and the lower the bills.
- Don't over cool: 1°C difference in temperature between indoors and outdoors adds 10% to your bill and increases greenhouse gas emissions by the same amount.
- Switch off cooling appliances when you go out. This generates less greenhouse gas and is cheaper than leaving them on low.

Save money whilst staying cool this summer

Greenland ice sheet thins

Latest studies show that the Greenland ice sheet has been thinning faster than scientists expected, proving that coastal margins of ice sheets can respond quite rapidly to external changes like global warming. From 1993 to 1998 the east coast of Greenland, where most of the thinning was reported, was experiencing warmer than normal temperatures.

One or two decades ago, scientists began suggesting that global warming could cause the world's oceans to rise by several metres. This might represent one of the greatest threats of human-induced climatic change, first affecting insular and coastal populations and rapidly extending to inner regions if the volume of water in the oceans increases substantially.

Most scientists agree that the rate of recent rise in sea level is two millimetres a year. But the key question still facing researchers and civil planners is whether a warmer climate will lead to a sudden acceleration in the rate of sea level rise.

Sample articles for your internal emails, staff newsletters and bulletins. Sample noticeboard posters.

GREEN GAZETTE

TENANT ENVIRONMENTAL NEWS
NOVEMBER - DECEMBER 2000

Choose Green Power for a better future

Australia's emissions of harmful greenhouse gases are among the highest, per person, in the world. This is because one quarter of Australia's production of carbon dioxide, the main greenhouse gas, comes from burning coal to generate electricity.

However, you can make a difference by opting for the environmentally friendly alternative to coal-generated electricity and becoming a *Green Power* customer through your electricity retailer. Ask your electricity retailer about their own government-accredited *Green Power* product which means the retailer agrees to buy electricity from clean, renewable sources like solar, wind, hydro and bioenergy.

New generators are appearing throughout Australia as the demand for *Green Power* increases – for example, the new solar farm at Queenbeyan and the Crookwell wind farm in NSW. Plus all large landfills in NSW can trap gas to generate electricity, wastes from sugar mills in northern NSW are generating electricity and soon all the dams in NSW will use the energy from the water rushing past to create electricity.

If you're in NSW, call 136 206 to be automatically connected to your electricity retailer. If you're interstate, call your retailer and ask if they have an accredited *Green Power* product. For more information see the *Green Power* website (*www.greenpower.com.au*) or contact SEDA at (02) 9249 6100.

Hot tip: reach for the stars

If you've shopped around for whitegoods lately, you'll have seen Energy Rating Labels. All new refrigerators, freezers, airconditioners, clothes washers, dishwashers and tumble dryers must carry an Energy Rating Label, which indicates the energy consumption and energy efficiency of the appliance.

The number in the red box is the energy consumption figure, which shows how much energy in kilowatt-hours the appliance is likely to use in a typical household in a typical year. The number of stars in the curved red bar is the appliance's Star Rating – and the more stars, the more efficient the appliance. So shop wisely, go for the stars and you'll end up saving energy and money, and help the environment at the same time!

Did you know?

The most common greenhouse gas produced by human activity is carbon dioxide: one kilogram of CO_2 would fill a refrigerator and one tonne would fill a whole house. The average home produces about nine tonnes of greenhouse gases per year, just from energy use.

Leaving for the day?

Turn off your computer and help save energy and greenhouse gas emissions.

If you are last to leave the room...

switch off the lights.

It helps save energy and the environment.

5.2 Calculators

Calculator 1:
Buying new equipment

Calculator 2:
Lighting

Calculator 3:
Financial report and financial summary

Calculate your savings automatically at www.abgr.com.au

Calculator 1: Buying new equipment

Using the calculator to compare products

Follow these steps:

1. How many years will your equipment last? — place this value in **A.** 'Estimated life' box.
2. How many watts does the equipment use when 'on' but standing by (i.e. standby mode) and when in operation? Insert in **B.** If you have this information in kilowatts, move to the second half of section 1.
3. How long will the equipment be running per year in standby mode and when in actual operation? Insert in **C.**
4. How much is your organisation paying for electricity? Insert in **D.** This could vary between 5 and 12 cents per kilowatt-hour.
5. What are the anticipated average lifetime maintenance costs of each piece of equipment? Insert in **D.**
6. What is the purchase price of each product? Insert in **E.**

The sample calculation shows that Photocopier B is more energy efficient than Photocopier A. It also shows that whilst Photocopier A is the cheaper option based on initial purchase price, when future running costs are drawn into the equation, Photocopier B is the cheaper option. If both products meet your needs and deliver the same service, then Photocopier B is the better buy.

Worked example

Buying new equipment: Costs

Equipment types	Photocopier A No standby mode	Photocopier B With standby mode
A. Estimated life of equipment	5 yrs	5 yrs
B. POWER INPUT: insert watts or kilowatts		
Power input when in standby mode (watts)	700 watts	10 watts
Power input when in operation (watts)	1500 watts	1300 watts
(Convert to kilowatts by dividing by 1000)		
Power input when in standby mode (kilowatts)	0.7 kilowatts	0.01 kilowatts
Power input when in operation (kilowatts)	1.5 kilowatts	1.3 kilowatts
C. ENERGY CONSUMPTION: convert power input to kilowatt-hours (kWh)		
Operating hours when in standby mode (per year)	1900 hr	1900 hr
Operating hours when in operation (per year)	1100 hr	1100 hr
Annual energy consumption (kWh) = power input (kW) x operating hours		
Standby mode (e.g. 0.01 kW x 1900 hrs)	1330 kWh	19 kWh
Operational mode (e.g. 1.3 kW x 1100 hrs)	1650 kWh	1430 kWh
Total = standby + operational mode	2980 kWh	1449 kWh
Lifetime energy consumption = total annual energy consumption x estimated life	14900 kWh (2980 x 5)	7245 kWh (1449 x 5)
D. RUNNING COSTS		
Average electricity price ($ per kWh)	$0.10	$0.10
Annual energy costs = annual energy consumption x energy cost	$298 (2980 x $0.10)	$145 (1449 x $0.10)
Annual maintenance cost	$150	$100
Total annual running costs = annual (energy + maintenance) costs	$448 (298 + 150)	$245 (145 + 100)
Lifetime running costs = annual (energy + maintenance) costs x lifetime	$2,240 (448 x 5)	$1,225 (245 x 5)
E. PURCHASE PRICE		
Purchase price of equipment	$1,800	$1,900
TOTAL COST of equipment over its life = lifetime running costs + purchase price	**$4,040 (2240 + 1800)**	**$3,125 (1225 + 1900)**

Savings are worked out on next page

Worked example

Buying new equipment: Savings		
Lifetime energy savings = lifetime energy consumption of (equipment A – equipment B)	7655 (14900 – 7245)	kWh
Is the space airconditioned (and the cost borne by you)? If yes, 10% more energy savings are possible* If no, use initial energy savings calculated (i.e. 7655 kWh)	 = 8421 (7655 x 1.10)	
Total lifetime energy savings	8421	kWh
Total lifetime dollar savings = total energy savings x average price of electricity	$842 (8421 x $0.10)	
Estimated conversion cost (parts and labour) e.g. difference between the purchase prices of photocopiers.	$100	
Simple payback period** = estimated conversion cost/ (lifetime dollar savings/lifetime) = 100/(842/5)	0.59	years This means the additional capital cost is paid back in less than 1 year
Average rate of return (ROR)** = total dollar savings per year/conversion cost x 100 = (842/5)/100 x 100	>100%	A 100% ROR means the energy savings will pay back the conversion cost within one year. In this case it will be paid back in under a year.
Greenhouse gas reduction	7	tonnes (in NSW)***
(1 kWh = 0.92 kg CO_2, 1 MWh = 0.92 tonnes CO_2) ***	1	cars (in NSW)
= lifetime energy savings/1000 x 0.92 = 8421 kWh/1000 x 0.92 = 7.12 tonnes CO_2 abated		

* reducing the heat load generated by office equipment in an airconditioned space can increase energy savings by up to 10% as less energy is required to cool the space.

** See *Glossary* for a definition

*** CO_2 emissions from electricity generation varies from state to state depending on the fuel type (i.e. black coal, brown coal, natural gas etc.) used. For your calculations, enter the appropriate value from the table below according to where your business is located.

State	CO_2 emissions (tonnes/MWh)
NSW, ACT	0.92
Victoria	1.34
Queensland	1.02
SA	0.95
WA	1.10
Tasmania	0.00
NT	0.69
Australian average	1.00

Buying new equipment: Costs

Equipment types	Equipment A No standby mode	Equipment B With standby mode
A. Estimated life of equipment	yrs	yrs
B. POWER INPUT: insert watts or kilowatts		
Power input when in standby mode (watts)	watts	watts
Power input when in operation (watts)	watts	watts
(Convert to kilowatts by dividing by 1000)		
Power input when in standby mode (kilowatts)	kilowatts	kilowatts
Power input when in operation (kilowatts)	kilowatts	kilowatts
C. ENERGY CONSUMPTION: convert power input to kilowatt-hours (kWh)		
Operating hours when in standby mode (per year)	hr	hr
Operating hours when in operation (per year)	hr	hr
Annual energy consumption (kWh) = power input (kW) x operating hours		
Standby mode (power input (kW) x operating hours)	kWh	kWh
Operational mode (power input (kW) x operating hours)	kWh	kWh
Total = standby + operational mode	kWh	kWh
Lifetime energy consumption = total annual energy consumption x estimated life	kWh	kWh
D. RUNNING COSTS		
Average electricity price ($ per kWh)		
Annual energy costs = annual energy consumption x energy cost		
Annual maintenance cost		
Total annual running costs = annual (energy + maintenance) costs		
Lifetime running costs = annual (energy + maintenance) costs x lifetime		
E. PURCHASE PRICE		
Purchase price of equipment		
TOTAL COST of equipment over its life = lifetime running costs + purchase price		

Buying new equipment: Savings		
Lifetime energy savings = lifetime energy consumption of (equipment A – equipment B)		kWh
Is the space airconditioned (and the cost borne by you)? If yes, 10% more energy savings are possible* If no, use initial energy savings calculated.		
Total lifetime energy savings		kWh
Total lifetime dollar savings = total energy savings x average price of electricity		
Estimated conversion cost (parts and labour) e.g. difference between the purchase prices of photocopiers.		
Simple payback period** = estimated conversion cost/ (lifetime dollar savings/lifetime)		years
Average rate of return (ROR)** = total dollar savings per year/conversion cost x 100		A 100% ROR means the energy savings will pay back the conversion cost within one year.
Greenhouse gas reduction		tonnes (in NSW)***
(1 kWh = 0.92 kg CO_2, 1 MWh = 0.92 tonnes CO_2) *** = lifetime energy savings/1000 x 0.92 = χ tonnes CO_2 abated		

* reducing the heat load generated by office equipment in an airconditioned space can increase energy savings by up to 10% as less energy is required to cool the space.

** See *Glossary* for a definition

*** CO_2 emissions from electricity generation varies from state to state depending on the fuel type (i.e. black coal, brown coal, natural gas etc.) used. For your calculations, enter the appropriate value from the table below according to where your business is located.

State	CO_2 emissions (tonnes/MWh)
NSW, ACT	0.92
Victoria	1.34
Queensland	1.02
SA	0.95
WA	1.10
Tasmania	0.00
NT	0.69
Australian average	1.00

Calculator 2: Lighting

Worked example

The scenario:

A tenant has a single-floor office space which has 20 light fittings, each with two standard 36 watt fluorescent lamps and magnetic ballasts. It is proposed to upgrade each fitting to one triphosphor fluorescent lamp with a specular reflector in each fitting. The magnetic ballast is to be replaced with an electronic ballast.

NOTES

1 An electronic ballast will run the lamp at a lower wattage (i.e. 32W), but there is still a ballast loss of 4W. Therefore the power input for one lamp and the ballast = 36 W.

2 If installing a reduced voltage system, adjust your energy consumption figure for the new lighting system by multiplying by 0.9 (gives 10% reduction).

3 There is a saving in airconditioning cost associated with a reduced lighting load. These savings vary according to the type of airconditioning system installed. As a rule of thumb the energy saving can be increased by 25% due to a reduction in airconditioning load.

4 See *Glossary* for explanation.

5 See *Glossary* for explanation. A 100% ROR means the energy savings will pay back the conversion cost within one year. In this case it will be paid back in less than a year

6 CO_2 emissions from electricity generation vary from state to state depending on the fuel type (i.e. black coal, brown coal, natural gas etc.) used. For your calculations, enter the appropriate value from the table below according to where your business is located.

State	CO_2 emissions (tonnes/MWh)
NSW, ACT	0.92
Victoria	1.34
Queensland	1.02
SA	0.95
WA	1.10
Tasmania	0.00
NT	0.69
Australian average	1.00

This lighting calculator is useful for working out savings from upgrading light fittings. For more complex upgrades involving controls, for example, consult a lighting expert to make evaluations.

Worked example

Lighting calculator

	EXISTING LIGHTS	NEW LIGHTS
Lamp type	Standard fluorescent	Triphosphor fluorescent
1. Power input		
Number of light fittings	20	20
Number of lamps per fitting	2	1
Total number of lamps	40	20
Power input of each lamp	36 watts	36 watts
Power input of each ballast[1]	9 watts	4 watts[1]
Total power input = total number of lamps x power input of (lamp + ballast)	1800 watts =40 x (36 + 9)	720 watts =20 x (36 + 4 – 4)
2. Annual energy consumption by converting power input to kilowatt-hours (kWh)		
Operating hours per year	3000 hr	3000 hr
Total annual energy consumption[2] = total power input/1000 x operating hours per year	5400 kWh = 1800 watts / 1000 x 3000 hrs	2160 kWh[2] = 720 watts / 1000 x 3000hrs
3. Annual lighting energy costs		
Average electricity price ($ per kWh)	$0.10	$0.10
Total annual lighting energy costs = energy cost x total energy consumption	$540 = $0.10 x 5400 kWh	$216 = $0.10 x 2160 kWh
ANNUAL SAVINGS		
Energy saved = total energy consumption of (existing lights – new lights)	3240 kWh = 5400 – 2160	
Is the space airconditioned (and the cost borne by you)? If yes, 25% more energy savings can be made[3] If no, use initial energy savings calculated (i.e. 3240 kWh)	4050 kWh = 3240 x 1.25	
Total energy to be saved per year	4050 kWh	
Dollar savings per year = energy cost x total energy savings per year	$405 = $0.10 x 4050	
Annual maintenance costs saved	$50	
Total dollar savings per year	$455	
Estimated conversion cost (parts and labour)	$400	
Simple payback[4] = conversion cost/total annual savings	0.9 years = $400/$469	
Average rate of return (ROR)[5] = (total dollar savings per year/conversion cost) x 100	114% = ($455/$400) x 100	
Greenhouse gas reduction = total energy savings in kWh/1000 x coefficient for state	3.7 tonnes CO_2 (in NSW)[6] = 4050 kWh/1000 x 0.92	
Equivalent to taking how many cars off the road? (on average, 1 car produces 4.5 tonnes of CO_2 in a year) = greenhouse gas reduction (tonnes) / 4.5	almost 1 car off the road (in NSW)	

Lighting calculator (can be used for any lighting technologies)

	Type 1	Type 2
Lamp type	Type 1	Type 2
1. Power input		
Number of light fittings		
Number of lamps per fitting		
Total number of lamps		
Power input of each lamp	watts	watts
Power input of each ballast[1]	watts	watts
Total power input = total number of lamps x power input of (lamp + ballast)	watts	watts
2. Annual energy consumption by converting power input to kilowatt-hours (kWh)		
Operating hours per year	hr	hr
Total annual energy consumption[2] = total power input/1000 x operating hours per year	kWh	kWh[2]
3. Annual lighting energy costs		
Average electricity price ($ per kWh)		
Total annual lighting energy costs = energy cost x total energy consumption		
ANNUAL SAVINGS		
Energy saved = total energy consumption of (existing lights – new lights)	kWh	
Is the space airconditioned (and the cost borne by you)? If yes, 25% more energy savings can be made[3] If no, use initial energy savings calculated	kWh	
Total energy to be saved per year	kWh	
Dollar savings per year = energy cost x total energy savings per year	$	
Annual maintenance costs saved	$	
Total dollar savings per year	$	
Estimated conversion cost (parts and labour)	$	
Simple payback[4] = conversion cost/total annual savings	years	
Average rate of return (ROR)[5] = (total dollar savings per year/conversion cost) x 100	%	
Greenhouse gas reduction = total energy savings in kWh/1000 x coefficient for state	tonnes CO_2[6]	
Equivalent to taking how many cars off the road? (on average, 1 car produces 4.5 tonnes of CO_2 in a year) = greenhouse gas reduction (tonnes) / 4.5	cars off the road	

Calculator 3: Financial savings

You can use the following example as a guide to create your own Financial Report and Summary, setting out project details with capital costs, energy savings, rates of return and greenhouse implications to present to your decision-makers.

Alternatively you can go to the *Financial Savings Calculator* on the website, insert the relevant information and print out the report.

The web address is **www.abgr.com.au**

If you are using the web calculator, the calculations are automatic. Otherwise, you need to do the calculations as shown in the table.

The following information is required.

A. The price being paid for energy. You should note that demand and usage charges are a large part of a company's energy bills. The amount per unit should take these charges into account. For example, a new electricity supply contract might have been negotiated with a cost of four cents per kilowatt-hour, but when the extra charges are taken into account, the cost is actually seven cents per kilowatt-hour. For more information see 3.6 *Negotiating an energy supply contract*.

B. Project life. Estimated time before another upgrade would be warranted; 15 years recommended for most projects.

C. Capital cost. Quotes might have already been obtained or estimates can be made. If not, they should be obtained from suppliers or from details of work already carried out.

D. Energy savings. Using the calculators provided for the various technologies (lighting, equipment), calculate your energy savings and insert them into the financial report. Alternatively, use savings information provided by suppliers.

E. Indirect energy savings. This refers to an increase in energy savings due to another energy-consuming system using less energy, e.g. a lighting upgrade will reduce the heat load of a building which in turn will reduce the amount of energy required by the airconditioning system to cool a building (ask your energy consultant or equipment supplier for an estimate of indirect savings).

H. Other annual costs. By using equipment that lasts longer or by improving the way a system works, replacement or maintenance costs can be reduced. For example, installing compact fluorescent lamps is a double saving. Not only do the lamps last longer, but you also make maintenance savings by not having to replace them as often.

J. CO_2 emissions from electricity generation vary from state to state depending on the fuel type (i.e. black coal, brown coal, natural gas etc.) used. For your financial calculations, enter the appropriate value from the table below according to where your business is located.

State	CO_2 emissions (tonnes/MWh)
NSW, ACT	0.92
Victoria	1.34
Queensland	1.02
SA	0.95
WA	1.10
Tasmania	0.00
NT	0.69
Australian average	1.00

NOTES

* The *Financial Savings Calculator* on the website also displays and calculates Internal Rate of Return (IRR) and Net Present Value (NPV). For explanations of these terms, see the *Glossary* on page 107 of this handbook.

Worked example

Financial savings calculator (reflecting the lifetime value of the project)

Project description	Lighting upgrade		
Economic parameters			
A. Average electricity price	10	c/kWh	Obtain from electricity bills
B. Project lifetime	15	years	
Economic analysis			
C. Capital cost	$30,000		The cost of the products and services required for the installation/upgrades
D. Reduction in annual energy consumption	100,000	kWh pa	
E. Indirect reduction in annual energy consumption	1000	kWh pa	e.g. reduction in airconditioning load as a result of proposed upgrade.
F. Total annual savings in energy consumption	101,000	kWh pa	**D + E**
G. Reduction in annual energy cost = Total annual savings in energy consumption x average electricity price = 101,000 x $0.10	$10,100	pa	= 101,000 x 10 cents **F x A**
H. Reduction in other annual costs	$100	pa	e.g. maintenance
I. Total annual savings	$10,200		**G+H**
Simple payback* = capital cost/total annual savings = $30,000/$10,200	2.9	years	**C/I**
Average rate of return (ROR)* = (Total annual savings/capital cost) x 100 = ($10,200/$30,000) x 100	35%		(**I/C**) x 100
Greenhouse gas reduction			
J. CO_2 emissions from electricity generation	0.92	tonnes/MWh	This is the current average figure for NSW
K. Greenhouse gas reduction ($1kWh = 0.92kg\ CO_2$, $1MWh = 0.92$ tonnes CO_2) = Total annual savings in energy consumption/1000 x 0.92 = 101,000 x 0.92 92.92 tonnes /4.5	92.92 21	tonnes/yr cars	(**F**/1000) x **J** 1 car generates 4.5 tonnes of CO_2 p.a **K**/4.5

Having completed the calculations, you are now in a position to complete the Financial Summary, as shown below, which can also be printed from the web calculator.

Financial summary: Lighting upgrade project

Project details

Capital cost:	$30,000
Energy savings:	$10,100 p.a.
Reduction in other annual costs:	$100 p.a.
Total annual cost savings:	$10,200 p.a.
Simple payback:	2.9 years
Average rate of return	35%
Reduction in greenhouse gas emissions:	93 tonnes p.a.
Equivalent to cars off the road	21 cars

Assumptions

Average electricity price:	10 c/kWh
Project lifetime:	15 years

5.3 Units and conversions

Units

Quantity	Unit	Symbol
Electrical current	amperes	A
Energy	joule	J
Energy	kilowatt-hour	kWh
Illumination	lux	lx
Length	metre	m
Light output	lumen	Lm
Mass	kilogram	kg
Mass	tonne	t
Power	watt	W
Pressure	pascal	Pa
Temperature*	kelvin	K
Volume	litre	L

* to convert Kelvin to degrees Celsius, subtract 273 i.e. 273K = 0°C

Multiple unit prefixes

Unit	Symbol	Order of magnitude
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}

Conversions

Energy to greenhouse gas emissions – Australian averages

Fuel	Unit	Equivalent CO_2 emissions kilograms (kg)
Electricity	1 kWh (kilowatt-hour)	1.0
	1 GJ (gigajoule)	3600.0
Green Power	1 kWh	0.0
Gas	1 kWh	0.39
	1 GJ	108.0

Quantity	To convert from		to		Multiply by
Energy	Btu kWh	British thermal units kilowatt-hours	kJ MJ	kilojoules megajoules	1.055056 3.6
Power	hp	horsepower	kW	kilowatts	0.75
Length	ft in	feet inches	m cm	metres centimetres	0.3048 2.54
Temperature	^oF	degrees Fahrenheit	^oC	degrees Celsius	$^oC = .555 x (^oF – 32)$
Pressure	psi	pounds per square inch	kPa	kilopascals	6.9
Mass	lb	pounds	kg	kilograms	0.45
Volume	m^3	cubic metres	l	litres	0.001
Velocity	f/s	feet per second	m/s	metres per second	0.3048
Flow rate	cfm	cubic feet per minute	m^3/s l/s	cubic metres per second litres per second	0.000472 0.472

5.4 Useful websites

The following websites contain information relevant to several technologies and systems. Additional websites are listed throughout the handbook to direct you to more information specific to each energy saving technology.

In most cases, the addresses extend to the exact location of the relevant material within the website. These extended addresses can change, although home page site addresses usually do not.

Australian Greenhouse Office
Managing Energy in Local Government – This site is also applicable to the business sector. Energy sheets covering: negotiating energy contracts and lease arrangements, office equipment, lighting and more.
http://www.greenhouse.gov.au /lgmodules/workbook/

Building Greenhouse Rating Scheme
http://www.abgr.com.au

ClimateLink
A public information service that provides free access to the U.S. EPA's education and public outreach materials on global warming, including brochures, fact sheets, slideshows, videos and CD-ROMs. http://www.epa.gov /globalwarming/climatelink

Energy Efficiency and Conservation Authority (EECA) – Business section
Energy saving tips and online publications.
http://www.energywise.co.nz/

Energy Efficiency and Renewable Energy Network (US Department of Energy)
Energy Glossary and *Fact Sheets* covering lighting, airconditioning, water heating, insulation, building design, motors. Also provides on line access to ask an energy expert questions.
http://www.eren.doe.gov/consumerinfo/

Energy Efficiency Best Practice Program (UK)
A number of publications on many best practice technologies and management systems. Access to them is obtained by registering with the on-line Information Centre.
http://www.energy-efficiency.gov.uk

Energy Efficiency Best Practice Program (Department of Industry, Science and Resources)
http://www.isr.gov.au/resources/netenergy /domestic/bpp/index.html

Energy Smart Allies Directory
- sets out names, contact details and a brief summary of companies that provide, supply and install energy efficient products and services.
http://www.energysmartallies.com/

Green Power
Everything you need to know about Green Power. Use the calculator to work out your household greenhouse gas emissions.
http://www.greenpower.com.au

Pacific Gas & Electric Company, Smarter Energy – Business Purchasing Guide
includes guides for lighting systems, motors, compressed air systems and airconditioning systems.
http://www.pge.com/customer_services/ business/energy/smart/html/equipment_ guides.html

SEDA (Sustainable Energy Development Authority)
Information covering how your business can become more Energy Smart.
http://www.seda.nsw.gov.au/ and
http://www.energysmart.com/

Sustainable Energy Authority (previously Energy Efficiency Victoria)
Information on the Energy Smart Business and Government programs plus tip sheets on energy efficiency actions and management strategies.
http://www.sea.vic.gov.au

US Environmental Protection Agency – Energy Star Buildings Upgrade Manual
Information covering: lighting systems, heating and cooling systems, office equipment and financing your energy efficiency upgrade.
http://www.epa.gov/appdstar/buildings/ manual/index.html

5.5 Glossary

Financial terms

Average rate of return (ROR): The ratio of the additional savings generated by an investment to the cost of the investment
ROR = (Total annual savings / Capital cost) x 100.
For example, if the cost of a new factory is $10 million and it gives you an extra $1 million in profit each year, then its rate of return is 10% ($1mil/$10mil x 100 = 10%). A ROR of 10% means that the capital outlay will be recovered in (100/10)% = 10 years. A 35% ROR, gives a payback of 2.8 years (100/35)%.

Demand charge: A charge on your electricity bill for the maximum energy used in a specified period of time.

Discount rate: The percent that you discount your cash flows for financial modelling. Ideally, this should be the same as the Internal Rate of Return.

Internal Rate of Return (IRR): The measure of profitability of a project. The IRR technique assesses an investment against a required rate of return set by your company. For example, your company may have a requirement that all investments must have a 20% IRR and if you calculate that your investment has an IRR of 25%, then it can go ahead. The IRR is the discount rate when NPV = 0.

Net Present Value (NPV): This is the value of an investment when all future net cash flows are discounted back (using the discount rate) to their present value (this counters the effect of inflation). It is used to determine whether an investment should go ahead. If the NPV is equal to or greater than 0, the investment could be accepted.

Payback period (Simple Payback): The time taken for the savings or profit of investment to pay for the initial capital expenditure.
Payback period = Capital cost/Total annual savings
For example, a new lighting system costs $400 and the savings are $200 per year, the payback period is $400/$200 = 2 years.

Technical terms

Ballast: Main function is to provide the correct voltage to start fluorescent and HID lamps (a higher voltage is required to start the lamp than to operate it), then to match the incoming voltage to the lamp voltage and to reduce the current being supplied to the lamp.

Building Greenhouse Ratings:
Base Building: Energy used in providing heating, ventilation and airconditioning as well as lighting for central services and common areas.
Tenancy: Energy used by tenants for their power and lighting.
Whole Building: A combination of base building and tenancy energy use.

Coefficient of Performance (COP): An energy efficiency measure. The higher the number, the more efficient.

Colour rendition: Refers to the ability of a light source to convey the true colours of people and objects. The colour rendition index is the scale used to indicate this effect for specific light sources. It is a 0–100 scale, where 100 is excellent (true) colour rendition and 0 is poor colour rendition.

Compressor: Compresses air in a compressed air system to generate mechanical power. In airconditioners, heat pumps, and refrigerators a compressor forces a refrigerant gas to change into a high pressure gas to complete the refrigeration cycle.

Dimming: Reduces light output from a lamp and reduces the power requirement of the lamp. Also, extends the life of a lamp.

Economy cycle: An energy saving design feature that allows the building to be cooled with 100% outside air when outside air and humidity conditions are cool enough, thereby eliminating or reducing the need to run the airconditioning.

Efficacy: (In terms of lighting technology) the ratio of light output to power input into a light source i.e. lumens emitted per watt inputted.

Fluorescent lamp: The main type of general office lamp. Baton shaped lamps.

Glare: Brightness in the field of view which causes discomfort or loss of vision.

High Intensity Discharge lamp: The main alternative to high wattage incandescent lamps. They are generally used in outdoor or industrial applications e.g. high bay or floodlight lamps.

Illuminance: The amount of light on a surface measured as lumens per square metre or lux.

Incandescent lamp: The traditional type of artificial light source. They generate light by heating a substance, usually tungsten, to temperatures high enough to generate bright light.

Lamp life: The period in which the lumen output remains above 75% of the initial value.

Luminaire: The light fitting, including lamp holders, base, reflectors and diffusers.

Reflectors: Used to direct the light emitted by a lamp in the desired distribution pattern.

Solar heat gain: The heat load gained by buildings from the sun's energy.

Thermostat: A device for measuring the space temperature.

Transformer: An electric device used to reduce the voltage in an electrical circuit.

5.6 Sources

Australian Greenhouse Office 1999 *Managing Energy in Local Government* – fact sheets http://www.greenhouse.gov.au/lgmodules/workbook/

Global Warming Cool It! – A home guide to reducing energy costs and greenhouse gases

Baseline Study of Greenhouse Gas Emissions from the Commercial Buildings Sector with Projections to Year 2010 (prepared by EMET Consultants Pty Ltd and Solarch Group)

CADDET 1997 (Centre for the Analysis and Dissemination of Demonstrated Energy Technologies) *Saving Energy with Efficient Lighting in Commercial Buildings*

Department of Industry, Science and Resources (ISR) 2000 *Better Practice Guide — Lease Considerations for Energy Efficiency in Commonwealth Operations*

Department of Primary Industries and Energy June 1994 *Saving energy through lighting management*

Electricity Supply Association of Australia *How a few simple automatic controls can reduce your lighting bills* No.2 Commercial energy efficiency series

Energetics 1996 *Training Course on Building Energy Use* for SEDA

Energy Efficiency and Conservation Authority New Zealand http://www.energywise.co.nz/ Office equipment, savings tips, transport

Energy Efficiency and Renewable Energy Network US Department of Energy http://www.eren.doe.gov/ Lighting, purchasing, glossary

Energy Efficiency Victoria (now Sustainable Energy Authority) 2000 *Energy Management*

Energy Policy and Planning Bureau and the Greenhouse Co-ordination Council Western Australia 1994 *Energy-efficient Environment-friendly Office Equipment*

Energy Supply Association of Australia Ltd. 1999 *Electricity Australia*

Fuji Xerox Australia Pty Ltd. 1997 *Down-to-earth officecare — A practical guide to environmental action in the office*

Greenhouse Challenge Office 1997 *The Greenhouse Challenge Workbook — A six step guide to developing your cooperative agreement*

NSW EPA 1997 *NSW State of the Environment Report* http://www.epa.nsw.gov.au/soe/97/index.htm

NSW Government March 1998 *Action for Air: The NSW Government's 25-year Air Quality Management Plan*

NSW Government November 1998 *Action for Transport 2010: An Integrated Transport Plan for Sydney* http://www.transport.nsw.gov.au

Office of the Regulator-General, Victoria (ORG) 1998 *How do I negotiate a contract? — A guide for 160 MWh/Yr electricity customers...*

Rebuild Colorado – Energy Performance Contracting http://www.state.co.us/oec/rebuildco

SEDA 2000 *Producing and using Transport Access Guides*

SEDA 2000 *Energy Smart Toolbox — Your Profitable Business Strategy*

Sustainable Solutions Pty Ltd. 1998 *Rating Energy Efficiency of Non-Residential Buildings: A Path Forward for New South Wales*. A Report for the Sustainable Energy Development Authority.

www.abgr.com.au