

# save energy@school

Energy management for primary and  
secondary schools

**A guide for implementing a school energy  
management program that saves money and reduces  
greenhouse gas emissions.**

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## WHY SAVE ENERGY?

This Kit has been produced by the Department of Education and Training in partnership with the Sustainable Energy Authority for schools.

By saving energy at school, your school community can take the necessary steps to effectively manage energy consumption, save money and reduce greenhouse gas emissions. Research conducted by the Authority shows that most schools can save between 10-15% without capital expenditure. Savings of up to 40% are achievable where a school invests in energy efficient technology. The savings are both financial and environmental.

Energy efficiency measures such as those recommended on this CD also reduce the load placed on our energy infrastructure. If demand for power is responsibly managed there is less pressure for the construction of new generators.

### Energy management and curriculum

Energy management is primarily aimed at school administrators and those responsible for the efficient operation of school facilities. This guide therefore does not contain any curriculum materials but focuses upon ways to minimise and manage energy consumption and the use of energy efficient technology.

The Sustainable Energy Authority however, encourages schools to include the study of energy use and its impact on the environment within the curriculum, through the use of the save energy@school CD. This can serve to reinforce energy management and assist students to understand issues of energy and the environment.

### Energy efficiency and greenhouse gas emissions

There is now compelling evidence that the burning of fossil fuels is a prime contributor to what has become known as the 'enhanced greenhouse effect', which is resulting in global warming.

The Victorian Government is committed to addressing the issue of climate change and is supporting many programs aimed at reducing greenhouse gas emissions.

Energy efficiency is recognised as one of the most cost-effective elements in any greenhouse gas reduction strategy.

Any energy-saving measure that reduces energy consumption also decreases greenhouse gas emissions.

## Introducing energy management

As is the case for most businesses and homes, the cost of energy for schools is only a small component of annual expenditure. Energy costs are often treated as a fixed overhead with little thought of how energy consumption can be reduced. However, where energy consumption is not monitored, consumption can increase unnoticed. Unlike many overheads, energy and its cost can be measured, monitored and managed. The save energy@school CD-Rom provides the information and resources required for schools to establish a sustainable energy management program that will deliver real financial and environmental savings.

### Can your school make savings?

If little attention has been given to energy and water management in the past, it is possible that up to 40% can be saved on utility costs by embracing energy management. The best way to assess whether your school has the potential to save energy is to compare your school's consumption with the benchmarks in the Appendix.

The indicators listed below are also a good sign that there are savings to be made.

Are lights left on in unoccupied rooms?

Do staff use portable fan heaters or radiators?

Are heaters or air conditioners left on overnight?

Does the central heating make some rooms too hot while other rooms remain cold?

Are doors and windows left open with heaters on?

Are your school energy bills higher than similar sized schools?

If the above sound familiar, then Energy Management can help save energy, money and greenhouse gas emissions.

### Energy management in schools

The development of a school energy management program is a management activity that involves encouraging behavioural change and financial investment in energy efficient technology.

Consumption of energy can be managed by changing the habits and behaviour of staff and students. Savings without any extra expenditure result from the school community becoming conscious of energy conservation.

Further savings are realised by investing in energy efficient technologies and better maintenance of plant and equipment. Because energy efficiency saves you money, the best way to view any expenditure on energy management is as an investment that has a high return. Viewed this way the return paid on energy efficiency investments are often between 30% and 100%. With expert advice many savings for schools are described in detail in the Infosheets.

### Increased comfort and greater convenience

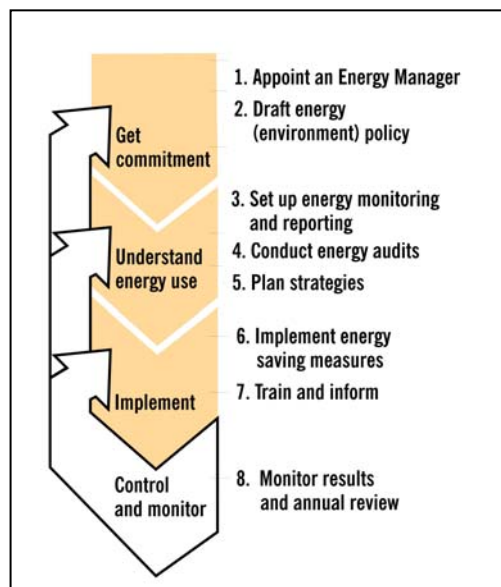
One of the common misconceptions about energy management is that people will experience reduced comfort and inconvenience. This is not the case.

The energy management strategies suggested create better conditions but use less energy, i.e. efficiency is improved. For example, a heating system that has had an improved temperature and timer control fitted is more efficient and maintains more comfortable room temperatures.

Better maintenance practices that form an integral part of energy management produce greater reliability of equipment.

## Establishing your Energy Management Strategy

Managing energy consumption is an ongoing process which can be easily integrated into the management practices of any school. The points below can help you implement an Energy Management Strategy in a way best suited to the needs of your school.



### Appoint an Energy Manager

The Energy Manager is the key facilitator to maintain the process, however for a successful program support is required from the whole school community. To be effective, this person should primarily coordinate the program and provide reports to the community. In many schools the Energy Manager is the person who has the responsibility for facilities as part of their existing role. *For more detailed information about the Energy Manager's role see page 7.*

### Consult and inform the school community

Explain your Energy Management Strategy and its benefits to staff and students. A whole-of-

school approach is always more successful than an individual crusade. Ask for ideas and invite volunteers to assist with its implementation. Stress that the money saved can be used for other purposes and that reduced consumption helps reduce environmental impacts such as those attributed to greenhouse gas emissions.

### Prepare an energy management policy

A written energy policy will guide and focus your efforts to improve your school's energy efficiency. Some schools include their energy policy as part of a broader environmental policy. The prime purpose of a policy is to create a document that confirms the commitment of the school to energy conservation. Consider including the policy and objectives in your school charter or strategic plan. *See Page 9 for a sample policy statement.*

### Monitor and record energy use

It is important to have a system to monitor energy use so that trends can be analysed and results measured. Consumption patterns can indicate possible areas of waste that require attention. Good records will provide a quantitative measure of the success of your energy management program, and a basis of reporting to the school community.

The Sustainable Energy Authority has developed the save energy@school Tracker Spreadsheet (available on this CD Rom) for this purpose. Information from energy bills is entered into the worksheets which then calculate energy benchmarks for your school, and creates charts.

### Conduct an energy audit or site survey

A site survey involves identifying where energy is being used and what opportunities there are to make savings.

Audits involve a survey of every room and area where energy is used. Lights and equipment are noted, along with duration of use.

An energy survey may only deal with one aspect of energy consumption. For example, a lighting survey would indicate what proportion of the electrical energy consumption was due to lighting.

Analysis of audit information in conjunction with billing data can identify the areas requiring the most attention. A report summarising the findings of the audit can allow informed decisions to be made about how best to improve energy management.

Audits can be conducted by a school staff member or by commercial energy consultants who specialise in energy audits. *Infosheet 9* provides more details about energy audits.

Some contractors describe an assessment of past electricity and gas accounts as an audit. This will not provide you with the itemised information required to identify the areas most likely to lead to the best savings.

## Prepare a plan of action

Develop and document an action detailing measures to reduce energy consumption. Actions may include behavioural changes from staff and students, up grades to equipment and other minor works. The plan should include a project timetable, any expenditure required and estimated financial and greenhouse gas savings.

A portion of the savings made should be reinvested in new energy reduction activities so that the benefits are compounded.

## Implement projects - train and educate others

Get some quick runs on the board.

Implement the projects as set out in your action plan. For example, you may find your heating system needs more urgent attention your lighting. The progress of individual projects will need to be closely monitored to ensure they achieve the desired energy targets within the specified timeframe.

The success of your energy management program will be greatly improved if the whole school community is informed and conscious of the decision to 'save energy @ school'. Involve all staff, students, parents and groups that use the school's facilities the development of energy saving plans and train them in the use of any new technology.

## Report and review results

Review your bills and energy consumption regularly, and enter relevant information into your energy spreadsheet file. Report your results and progress on a regular basis. This will help increase awareness of energy efficiency issues and will encourage ongoing commitment to the program.

## Annual review

An energy management strategy will be more effective if the results are reviewed annually, as it provides a basis for developing an action plan for the next 12 month period.

## The role of the Energy Manager

Nomination of a person (or group) to coordinate or manage the energy management program is necessary for effective implementation. In many schools the role of Energy Manager may fit into an existing job description. Some schools however may find it more convenient to split the role between two or three people.

The person or group responsible for the school's energy management coordinates the steps required to achieve a successful long-term reduction in energy consumption.

Key aspects of the role include:

- liaising with the Department of Education and Training;
- contributing to the development of energy and environmental policy;
- recording and monitoring energy consumption;
- identifying obvious areas of waste;
- communicating effectively with students, staff and administration;
- developing good housekeeping practices for staff and students;
- identifying cost-effective minor works that increase energy efficiency; and
- reporting progress and publicising how savings are benefit the school.

Background information and areas to check for potential savings are provided in the accompanying set of Infosheets.

## Golden rules for success

### 1. Get commitment

Gain support from the school administration, school council and staff. Schools will benefit more from broad-based support.

### 2. Understand energy use

Monitor and compare energy consumption and bills to determine how well you are doing.

### 3. Report and communicate

Provide simple, clear reports to the administration or school council on a regular basis (quarterly is a good period). Prepare charts and benchmarks generated by the Authority's spreadsheet file in your report.

### 4. Share the glory

Ensure that all parts of the school community receive praise and credit for making savings.

### 5. Promote achievements

Publicise your success to the schools community to obtain further support and funding.

## Developing an energy management policy

An energy management policy documents a school's intent to use resources in an efficient and environmentally-conscious manner. The policy is a statement that outlines energy conservation goals, targets and responsibilities. Putting the policy into writing gives the program a sense of purpose, enhancing its chances of success.

Since no two schools are ever exactly alike, it is important to devise an energy policy that suits your specific needs, activities and priorities. Some schools include energy conservation within a broader environmental policy that may also include water and water and waste management.

Consultation is the key to a successful policy. Widespread acceptance of the energy policy is more likely if everyone can contribute in some way. The school council, staff and parents could be invited to participate in the writing of the policy, and again at the reviewing stages.

The aim is to build a far-reaching commitment to energy management.

Once the policy statement is written, have it endorsed by the school's administration or council. Consider including the policy in the school charter or strategic plan. The policy should be a public document distributed to all groups within the school that have an interest in its implementation. See the sample policy statement on the next page.

### **REMEMBER**

To be highly effective, your energy management program should become an integral part of your school's management practices, where decision making is constantly viewed in light of energy implications. New equipment should be purchased only after assessing its energy efficiency. The cost savings achieved through energy efficiency can significantly outweigh any higher initial purchase costs.

## Sample policy statement

### Declaration of commitment

As part of our environmental strategy, we are committed to the responsible management of resources, and will practise energy efficiency throughout all our buildings and equipment.

### Policy

Our policy is to control energy consumption to:

- avoid unnecessary costs and free-up funds for other purposes;
- reduce greenhouse gas emissions and protect the environment;
- improve classroom conditions for students and staff; and
- prolong the useful life of fossil fuels.

### Objectives

Our long-term objectives are to:

- buy the most suitable energy efficient equipment;
- base purchases on full life-cycle cost;
- use resources/equipment as efficiently as is practicable;
- choose the most appropriate energy sources where possible;
- reduce the amount of pollution, particularly CO<sub>2</sub> emissions caused by our energy consumption; and
- reduce, wherever possible, our dependence on fossil fuels through the use of renewable energy.

### Immediate aims and targets

- to gain control over our energy consumption by reviewing and improving our energy use practices
- reduce energy use this year by 10% compared to last year
- reinvest 50% of any savings into new energy reduction measures over a 2-year period

### Responsibilities

- All persons in our school community will share responsibility for conserving energy use in this school
- Our Energy Manager (name of Energy Manager) will be responsible for collating energy consumption information and reporting to the school community

### Reporting

The Energy Manager will provide a brief quarterly report to the principal and school council on utility management activities, consumption and savings.

### Lines of communication

Formal communication on matters relating to the control of energy consumption will be directed through the Energy Manager who will, where appropriate, bring it to the attention of the school council or principal.

### Review

The energy management program activities will be subject to annual review.

### Action plan

During the coming year, the following energy management activities will be undertaken.

For example:

1. Involve teachers and students in a 'turn off the lights in empty rooms' program
2. Replace incandescent globes with fluorescent lamps by end of school year
3. Set thermostats for comfortable summer and winter conditions of 25oC and 20oC respectively
4. Delamp classrooms by using efficient triphosphor fluorescent tubes by end of school year
5. Audit heating energy use in our school to identify avoidable waste

*Use this example as a blueprint as you develop an energy policy to meet your school's specific needs.  
Rewrite or add any points that you think are relevant to your school.*

## Monitoring school energy consumption

Energy cannot be seen, but it can be measured. Utility companies measure the energy they supply to customers for billing purposes. Knowing how much energy your school uses, and when it is used, is a central aspect of energy management.

School energy consumption can be recorded and monitored on the save energy@school Tracker spreadsheet.

The spreadsheet will do the following:

- Benchmark energy performance for your school
- Help identify areas for potential savings
- Demonstrate savings achieved
- Assist with tariff analysis and energy price offers.

Reviewing past consumption involves entering information from utility bills into the spreadsheet. Twelve to eighteen months of billing information is usually preferred to create a clear picture of how much energy the school consumes through the seasons and to generate your school's energy benchmarks.

A good energy monitoring system requires a record of the following data.

### School data

- Number of students (for each year)
- Total floor area in regular use (in government schools this is the area referred to in cleaning contracts)
- Number of rooms used for students

### Electricity

- Account number
- Tariff or prices
- Meter reading dates (bill start and end date)
- Number of days in the billing period
- Peak electricity consumption in kWhs (kilowatt hours)
- Off-peak electricity consumption kWhs
- Maximum demand in kilowatts (kW) or kilovolt amps (kVA) (if on a demand tariff)
- Total cost

### Natural Gas

- Account number
- Tariff
- Meter reading dates (bill start and end date)
- Number of days in billing period.
- Consumption in MJ (megajoules)
- Total cost

### LPG or Liquid Fuels

- Account number
- Price per litre or kg
- Delivery date
- Total cost

The energy data is obtained from the gas, electricity or other energy bills received. Note that sometimes the relevant information is displayed on the rear of the bill, so if working from copies, make sure both sides are photocopied. If it is difficult to find past bills, energy companies should be able to provide a summary of the information required. Typically up to 2 years of historical data can be provided.

The save energy@school Tracker spreadsheet generates many useful graphs that can be used to display your energy use. See opposite page for sample graphs.

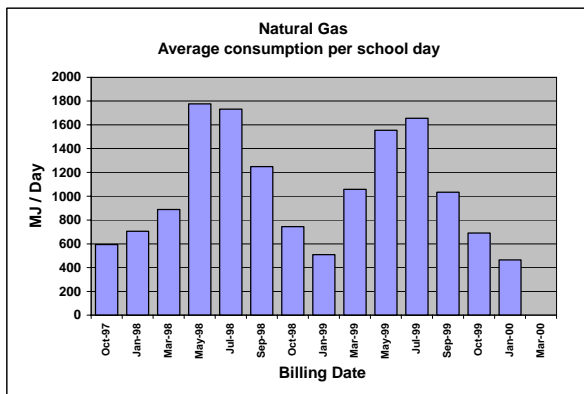
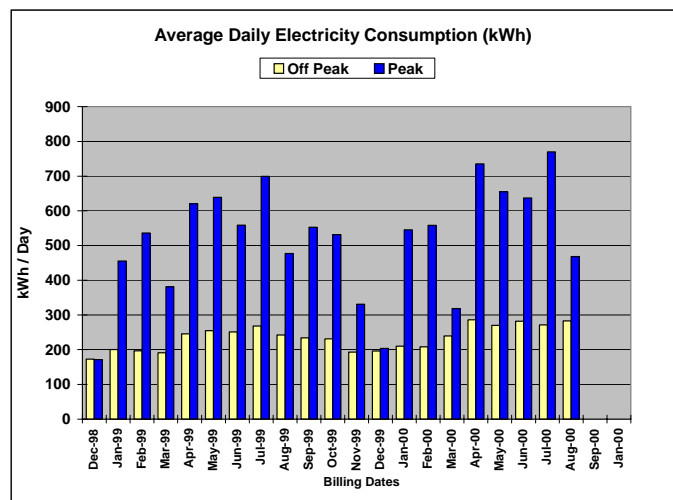
Infosheet 8 explains how to use the Save Energy @ School spreadsheet file. Sustainable Energy Authority staff can also assist schools with interpretation and analysis.

In some cases schools may choose to develop their own energy monitoring system. This can be quite satisfactory provided the record is of energy and is related to dates of consumption.

Some contract energy management service providers also offer, for a fee, a database bureau service that will regularly report your energy consumption. Generally, these services are too expensive for schools and funds are better spent on implementing energy-saving measures.

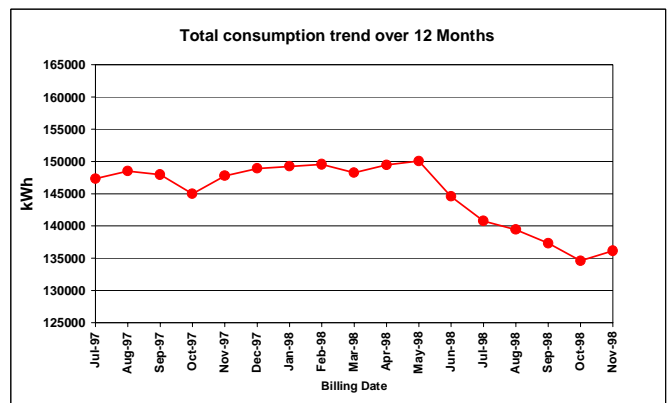
You may also choose to take readings directly from electricity, gas or water meters. This will allow you to monitor consumption over the course of the billing period. Some schools make this task a student project. Infosheet6 provides information about reading gas and electricity meters.

*This chart shows the average daily peak and off peak electricity use for a school.*



*This chart shows how gas has a strong seasonal consumption pattern*

*This chart shows how a school's total electricity consumption is growing or declining.*



## Energy Benchmarks

Benchmarking involves taking the annual totals for consumption and/or costs for each utility and dividing by one of your school data figures, eg. total cost of energy (electricity and gas) divided by number of students. You can then compare your school to the benchmarks established by the Sustainable Energy Authority for similar Victorian schools. See the Appendix for a full list of benchmarks.

Benchmarks calculated by the spreadsheet include the following.

- Total energy per student (GJ/student)
- Total energy per square metre floor area (MJ/m<sup>2</sup>)
- Greenhouse gas emissions per student (kg{CO<sub>2</sub>} / student)
- Total energy cost per student (\$ / student)
- Proportion of electricity to gas consumption (%)

Other useful benchmark measures include the following.

- Electricity consumption per student and/or per square metre (kWh / student, kWh / m<sup>2</sup>)
- Percentage of off-peak electricity
- Gas consumption per student and/or per square metre (MJ / student, MJ / m<sup>2</sup>)

## Limitations to benchmarking

If your energy consumption is significantly different from the benchmarks there may be a reasonable explanation. Many factors may play a role in your energy consumption, some of which are beyond your control and do not reflect the energy efficiency of your school. For example:

- where student numbers are low for the size of the school or heated areas are under-used, the energy costs per pupil will inevitably be higher;
- the age of your school and its equipment may influence consumption;
- extending the hours of school use is likely to increase energy costs considerably; and
- additional facilities, such as a swimming pool will significantly increase energy use.

Take these factors into account while you are making your assessments and adjust your energy management program accordingly. The most important is that you aim to reduce your school's energy consumption over time.

Regardless of how you compare to other schools, there is always room for improvement. Schools with high energy use compared to the benchmarks have the greatest potential for making savings, and those with low energy consumption should be vigilant to ensure their efficient performance is maintained.

### REMEMBER

If you can't measure it, you can't manage it.

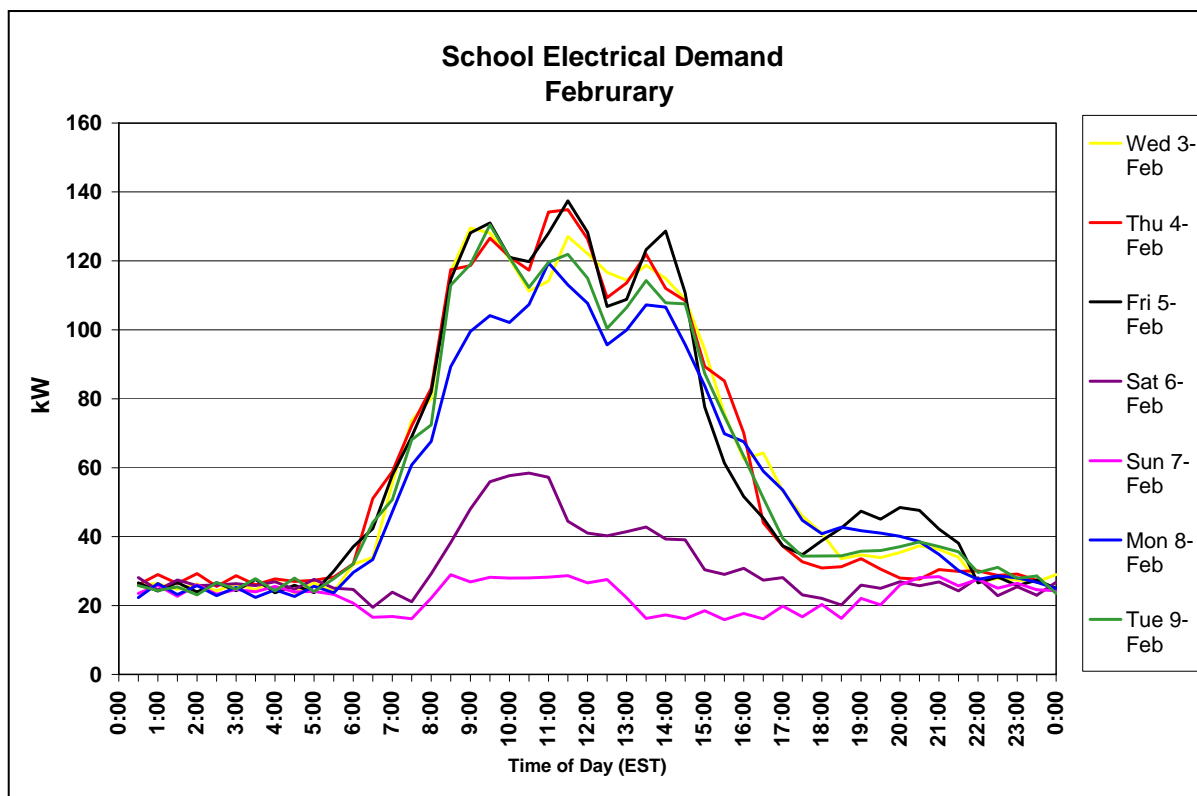
## Smart meter data for electricity consumption

Schools that have contestable electricity accounts may have an electronic electricity meter, known as a 'smart meter' installed. These meters allow your electricity retailer to measure your power consumption at frequent and regular intervals during each day. Measurements every 15 minutes is common. The readings are transmitted via a telephone line or mobile phone to the retailer for billing purposes. This data can be made available to customers on request and is very useful for determining when peak loads occur, and the quantity of energy consumed during and out of school hours. The latter data can be very useful if a school hires out its facilities.

Several retailers post smart meter data on the Internet and access is via password. This may be the easiest way to obtain the information. Alternatively contact the account manager named on the electricity invoice, and request that smart meter data be e-mailed in MS Excel format for a recent winter month (e.g. August) and a summer month (e.g. February). Usually the data will include either consumption (kWh) or demand (kW) divided into 15 (or 30) minute

intervals. Check with the retailers as to the units used as this can vary between retailer and network area.

If you require regular access to this data, it is advisable to have this specified in a clause in your negotiated electricity price contract, as retailers can charge fees for smart meter data.



*This chart called a load profile is typical of what can be derived from an electricity smart meter. Each line shows the power being used throughout each day of a week. Note the drops that indicate lower demand during recess and lunchtime, and over night consumption.*

#### **Put your computers to sleep with 'Energy Star'**

Computers can waste significant amount of energy if left on when not required. To save switching the machines on and off throughout the day the 'Energy Star' features should be enabled on all computers. This feature allows the computer to automatically operate in a very low power, or sleep mode, when not in use, saving up to 95% of energy consumption.

## Motivating people to save energy

A large proportion of energy wasted can be saved with a change in people's attitudes and behaviour.

Motivating the school community to behave in an energy-conscious manner is a key factor in saving energy.

Staff and students will be more motivated if they are aware of the following:

- How energy conservation can help the environment
- How their everyday behaviour can make a difference
- How they will benefit by saving energy at school

You may have to tailor the approach to suit particular individuals or small groups. What motivates students will probably be very different from what motivates teaching staff.

The following suggestions may be of help.

### School council

One of the main objectives of a school council is to monitor budgets and approve school policies. Most school councils are also concerned with the image and reputation of your school.

It is important to demonstrate how the school will benefit from energy efficiency measures. The best approach may be to describe how savings will be achieved and suggest possible uses for the savings, eg. new equipment.

### Staff

The benefits of energy efficiency to staff can include improved classroom comfort as a result of better lighting, and more efficient heating and cooling systems. More funds for curriculum generated from energy savings can also motivate staff and a personal sense of achievement can result just from seeing the results. Staff may sometimes need informing about which items consume the most energy.

Some schools also link their energy management strategy to a curriculum unit. See the save energy@school CD-Rom P-10 curriculum resources and more information

### Students

Information on the environmental impact of energy use can make a deep impression upon students. Energy efficiency can be presented in terms of its impact on the greenhouse effect and climate change. Students can calculate the schools contributions to greenhouse gas emissions or the savings made when energy is reduced. Each kWh of electricity consumed produces greenhouse gas emissions of 1.467kg, and each MJ of natural gas produces 0.058 kg.

### Parents

Parents, like teachers, will appreciate that savings from energy consumption can be redirected to other school activities. The savings from energy reductions can equate to many hours of voluntary fund raising.

Strategies and activities at schools may also be reinforced at home. Household energy savings tips and information sheets on a wide range of home energy topics are available from the Sustainable Energy Authority ([www.seav.vic.gov.au](http://www.seav.vic.gov.au)).

## Some Energy Smart motivation tips

- Run a staff training and information session at the beginning of your program's implementation
- Always listen to, and consider other people's suggestions
- Set up a student competition to design the best logo, slogan or cartoon about your energy saving campaign
- Use stickers and signs to remind people to switch off lights and appliances
- Have periodic displays in a central area of the school
- Remind students and staff of the tangible benefits of saving energy
- Give regular feedback and information to the school community about the progress of your energy management program. Use the internal school bulletins to publicise progress

## Promoting results

Promote energy management and market the success of energy reduction activities.

Communicating achievements inside and outside your school raises awareness of the benefits of saving energy.

Consider promoting your activities in the school

newsletter or magazine, noticeboards, website or other school publications.

### **Remember**

Feedback should be rapid, regular and meaningful.

Your communication to the general public can be in the form of:

- articles in the local newspaper or daily press;
- feature stories in school journals or magazines;
- entering awards;
- advertisements on community television;
- coverage on commercial television or radio; or
- page on your school's website.

## Energy Smart strategies

Reviewing your energy bills will not result in energy savings unless the results are translated into action. Here are some strategies aimed at the major areas of energy and water use in schools. More detailed information on different aspects of energy efficiency is contained in the InfoSheets.

### Heating and cooling - InfoSheets 1 & 2

- Ensure central heating systems are not left on unnecessarily outside school hours and that room heaters are off during lunch breaks
- Regularly maintain heaters and boilers
- Run evening classes and meetings in rooms with their own heaters, so the central heating is not required
- Fit a digital temperature and time controller to central heating
- Set thermostats at the lowest comfortable temperature in winter (18 – 20°C) and a minimum of 24°C in summer
- Eliminate the use of electric fan heaters
- Turn off pilot lights over summer and during holidays periods
- Where possible convert oil or LPG heating to natural gas
- Reduce hot and cold draughts through doors by weather-stripping, installing door closers or building wind breaks
- In rooms with large north and west-facing glass areas, cover some windows with insulated panels (such as noticeboards) to reduce winter heat losses and summer heat gains
- In rooms with high ceilings, use ceiling fans in winter on a low setting to recirculate warm air from the ceiling. In summer, fans improve comfort
- Use fans or evaporative coolers instead of refrigerated air conditioners
- Open doors and windows to increase natural ventilation when outside air is cooler. Close doors if refrigerated air conditioning is being used
- Shade and seal skylights to reduce summer heat gain

### Lighting – InfoSheet 3

Lights can use over half of the electricity consumed in a school. Yet most of the operating hours of a school are in daylight, and most classrooms have large windows that allow good use of natural daylight.

Some energy saving strategies for lighting include the following.

- Make the most of natural light
- Ensure lights are switched off during breaks and after school. Teachers or student monitors could help with this task
- Install daylight and/or movement sensors to control lighting. A variety of options are available, from individual controls to school-wide systems
- Clean light fittings and remove or replace inefficient reflectors and diffusers. This can double light output
- Remove some lamps in areas where less light is needed, such as in corridors, near windows and above shelving (Delamp)
- Replace old-style fluorescent tubes with new efficient triphosphor tubes
- In high use areas, replace incandescent globes with compact fluorescent lamps
- When repainting, select light colours and avoid matt and heavily textured finishes that absorb light
- Rewire lights so they are grouped in energy efficient configurations. For example, lights near windows should have a separate switching system to those in dim areas within a room
- Label light switches so only those needed can be identified and switched on

## Office and other school equipment – InfoSheet 5

- Ensure new office equipment is as energy efficient as possible, and has an automatic 'sleep mode' activated. Develop guidelines for major purchases such as for photocopiers, kilns, security lights, heaters and coolers
- Ensure energy saving options are used on photocopiers and computers
- Switch off equipment when it is not needed:
- Manually – by operators or designated monitors or teachers: or
- Automatically – using timers, movement sensors or other devices
- When buying appliances such as refrigerators, freezers, clothes dryers and hot water systems, look for the energy rating label and choose appliances with a high star rating

## Hot water

- Fix dripping taps
- Insulate the hot water distribution pipework to minimise heat losses
- Ensure the temperature of domestic hot water storage units is not set above 60oC. Where new installations are made to personal hygiene areas, the outlet temperature must be set at 45oC
- Depending on site and usage, replace large central units with a number of small, efficient units located close to where hot water is needed
- Fit a timer to electric water heaters operating on day rate, to keep the hours of operation to a minimum
- Use natural gas hot water heating wherever possible
- If showers areas are provided, install low flow showerheads

## Water

- Water the school grounds and gardens in the early morning or late afternoon
- Do not over-water grounds
- Sub-meter the water being used on gardens and grounds so that you can accurately determine the proportion of water flowing back through the sewerage system
- Mulch gardens so they retain moisture
- Fix all leaking taps and toilet cisterns as quickly as possible
- Fit tamper-proof fittings to external taps
- Use spring-loaded taps in toilets
- Reduce the capacity of single flush toilets to a maximum of six litres

### Delamping

Often more fluorescent lamps are installed in classrooms than necessary. By using high efficiency, triphosphor tubes, less lamps can be installed and yet effective light levels can be maintained or increased.

Relamping older fluorescent lamps with fewer triphosphor tubes is called delamping. Typically schools can save about \$50 per classroom each year.

## GLOSSARY

### **Ampere (Amp or A)**

Unit for the measure of electric current that flows through a cable or appliance.

### **Contestable account**

Consumers that can choose their own energy retailer have contestable accounts.

### **Continuous flow hot water systems**

Often called instantaneous hot water heaters. These units do not store water but only heat water when required.

### **Domestic hot water**

Water heated for supply to hot water taps at sinks, basins and showers. Domestic hot water is not recirculated.

### **Energy audit**

The process of gathering and interpreting information about energy use in a building and making recommendations about reducing energy consumption.

### **Energy benchmark**

Average energy consumption for a similar group of sites (e.g. schools) expressed in a standardised form.

### **Energy consumption**

The amount of energy (gas or electricity) used over a period of time. Usually measured in kWh or MJ.

### **Energy Demand (or peak demand)**

The power or maximum power required at a single point in time. Usually measured in kW (electricity) or MJ/h (gas). Some electricity tariffs contain a charge based on the peak demand.

### **Extra low voltage (ELV) lamps**

Small two piece light fittings consisting of a dichroic lamp and a reflector, plus a transformer. Not recommended for general lighting purposes.

### **Franchise account**

Customers who do not have a choice of energy retailer have a franchise account. The tariff is regulated in Victoria by the Regulator General.

### **Heat pump**

A device that extracts heat from a low temperature environment and transfers the energy to a high temperature environment. The technology is used for water heating and air conditioning.

### **Heating hot water**

Water heated in a boiler and reticulated around a building for space heating.

### **Horsepower (HP)**

HP is an old unit of power.  
1 HP = 746W

### **Hydronic panels**

Panel through which heating hot water passes to transfer heat to the surrounding air.

### **Incandescent lamp**

Standard low-efficiency electric light bulb.

**IPPC**

The Intergovernmental Panel on Climate Change brings together the world's leading climate scientists to report on monitoring the greenhouse effect and global warming.

**Joule (j)**

Basic unit of energy.

**Kilojoule (kj)**

One kj is equal to 1000 joules.

**Lux**

Unit of light intensity.

**Megajoule (MJ)**

Equal to 1 000 000 joules.

A storage gas water heater may use about 25 MJ in an hour. A typical gas heated house uses about 40 000 MJ of gas in a year.

Calculation: 1 MJ = 1 kWh divided by 3.6

**Occupancy sensor**

Device that can switch off lights automatically when rooms are unoccupied by detecting the presence of people.

## APPENDIX

### School energy benchmarks

This table shows average energy use to Victorian primary and secondary schools.

	ENERGY			ELECTRICITY	GAS/OIL	COST	GREEN-HOUSE GAS	m <sup>2</sup> per student
	GJ per student	GJ per classroom	MJ per m <sup>2</sup>	KWh per student	MJ per student	\$ per student	Kg (CO <sub>2</sub> ) per student	
Primary	1.77	34.6	221	182	1125	\$38.73	321	8
Secondary	4.08	53.3	272	325	2775	\$65.27	628	15
Average (all schools)	2.64	40.7	236	226	1795	\$49.11	426	11

### Benchmarks classified by heating system

The type of heating system used in a school impacts on energy use. Benchmarks for schools with central heating systems using boilers or furnaces are compared to schools that have individual room heaters.

	ALL ENERGY			ELECTRICITY	GAS /OIL			COST
	GJ per student	GJ per classroom	MJ per m <sup>2</sup>	KWh per student	MJ per student	GJ per classroom	MJ per m <sup>2</sup>	\$ per student
Central heating (all*)	4.2	56.6	283.4	293.2	3082.5	44.3	210	\$67.80
Indiv. heaters (all*)	1.5	29.3	203.2	178.1	909.5	16.6	119	\$36.08
Central heating (PS)	2.9	56.0	283.2	206.7	2109.8	46.5	208	\$51.62
Indiv. heaters (PS)	1.5	29.2	202.9	175.4	878.7	16.5	118	\$35.50
Central heating (SC)	4.1	54.7	275.9	328.3	2820.1	40.3	201	\$65.70
Indiv. heaters (SC) ▽	3.2	33.0	213.0	286.0	2141.0	22.6	144	\$59.25

\* includes SDS sites (PS) primary (SC) secondary  
only one secondary school with individual room heaters in sample

▽

**Energy mix**

The mix of energy (% electricity) often indicates why costs and greenhouse gas emissions vary for schools with similar energy consumption.

	ENERGY GJ/STUDENT	MJ/m <sup>2</sup>	% ELECTRICITY CONSUMPTION
Primary school average	1.86	220	39.8%
Secondary school average	4.23	275	30.4%
Open plan (primary school)	4.6	455	20.8%
Centrally heated (secondary school)	4.23	275	30.4%
Centrally heated (primary school)	2.42	240	30.0%
Individual heaters (primary school)	1.54	200	43.2%

The data in each table is based on 1999 energy benchmarking study conducted by the Sustainable Energy Authority.