



Energy Audit

Site Name: St Vincent's Primary School

Address: 20 Fairway Drive

Clear Island Waters, Qld 4226

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Completed: 18 / 08 / 2008

Scope

This report was produced to expose excessive on-site energy consumption and identify potential energy savings with regard to electricity. Staff have been randomly surveyed, appliances tested and energy consumption calculated to ensure an accurate outcome. Where information was not consistent with consumption patterns statistical data has been used to assist with calculations.

Observations

Location

The school buildings are sparsely located on the property with the majority of classrooms situated to the east where they receive cool fresh breezes off the lake and sports field. The large surfaced recreational areas between blocks 4, 5, 6 & 7 allow for excellent cross ventilation of the classrooms in these areas and should help to keep temperatures low in summer. This benefit may be offset by the surfaced recreational areas that would collect and radiate heat in summer.

Building design

Administration

The administration block is of brick single storey construction in a horseshoe shape with small offices leading to a central hallway. The centre courtyard is blocked off by a lattice gate and is used to house the air-conditioner condenser units for the building. Cross ventilation is near impossible within the building due to this and therefore compensated by air conditioning in summer.

The administration building is lacking in natural light due to the privacy screens on the western side, the lack of windows in the staff room and the large eave on the northern side above the walkway. This lack of natural light is compensated by using large amounts of artificial light in the staffroom and most offices.

The covered walkway on the northern side inhibits natural light during winter and therefore restricts natural heating from solar radiation.

Resource Centre

The current configuration for this building is primarily open plan with a high ceiling leading to a windowed ventilation turret in the centre. While natural light is poor the opportunity for ventilation is good if the turret were to be used in summer to allow hot air to escape while perimeter windows were open.

The office area is poorly located with no natural light or ventilation. The large room to the north east has large windows on the northern side and good natural light but minimal ventilation as there are no other windows to allow for cross ventilation.

The store room at the south east is currently being used to house the network server tower and has the air-conditioner running 24 hours.

Classrooms

The classroom blocks 4, 5, 6 & 7 have good natural light and ventilation due to the large windows on the northern and southern sides. The upper floors generally had higher levels of natural light due to less tree foliage and additional light reflecting off other buildings, this was most obvious in block 7 where there is a line of trees on the southern side that shade the windows on the lower level.

The classrooms located at Block 3 all had poor natural light due to shading from the covered walkway on the northern side and very good ventilation from the large windows which allowed cross ventilation.

Block 8 and 9 classrooms had poor natural light levels due mainly to the covered areas and lack of windows. One classroom had a high ceiling with skylights facing to the west which would generally increase light levels and room temperature in the afternoons. The additional air space created by the high ceiling would increase space heating costs in winter.

OHSC & Tuck Shop

The OHSC room has very good natural light and ventilation due to the large windows and short eaves. The tuck shop is quite small with good ventilation and natural light when the shutters are open.

Energy Use

Habits

While conducting the energy audit staff were randomly surveyed with regard to their energy habits when at work. All were accommodating and most indicated toward the following trends.

- ✓ Air-conditioning is only used in extreme temperatures
- × Ceiling fans were rarely used
- ✓ Classroom lights were always turned off when the classrooms was not in use
- ✓ Classroom desktop computers are shut down at the end of the day
- ✓ Laptops are shut down when not in use
- × Some administration computers are left on overnight with the monitors turned off
- ✓ Classroom windows are usually left closed when air-conditioning is in use
- × There is no special shut down procedure for weekends or holidays periods
- ✓ Tuckshop refrigeration is minimised during holiday periods

From these trends approximate usage patterns were assumed and used to determine energy usage projections.

Existing Staff Initiatives

Most staff indicated that they always try to minimise energy usage and had empowered the students to contribute by monitoring classroom lighting and air conditioning. An environmental committee or group has been established.

Categories

To assist in identifying large loads all electrical appliances have been grouped into categories that reflects services within the school. These categories are summarised below.

| | |
|-----------------------|--|
| Air Circulation: | Ceiling fans, wall mounted oscillating fans and extraction units. |
| Air Conditioning: | Split system air conditioning units and ducted air-conditioning units. |
| AV Teaching: | Over head projectors, Televisions, VCRs, DVD Players, CD Players, Data Projectors all located in either the classrooms or library. |
| Computer Equipment: | Desktop Computers, Monitors, Printers and Laptops for student and staff use. This also includes the Plasma monitor in the staffroom. |
| Computer Network: | Computer network HUBS, Server and Air-conditioning unit dedicated to keep the Server cool. |
| Entertainment: | Televisions and computer gaming units located in OSHC and staffroom. |
| External Lighting: | All external lighting within the school |
| Food Prep: | All cooking appliances located in the tuckshop, staffroom, OSHC |
| Lighting - Admin: | Fluorescent and incandescent lighting within administration |
| Lighting - Classroom: | Fluorescent and incandescent lighting within classrooms |
| Lighting - Other: | Fluorescent and incandescent lighting within Resource centre and OSHC |
| Miscellaneous: | Telephone equipment, Fish tank equipment, musical instruments and electric hand dryers etc. |
| Photocopiers: | Photocopier machines throughout the school |
| Refrigeration: | All refrigeration units used for food storage within the school |
| Water Heating: | Electric hot water systems |

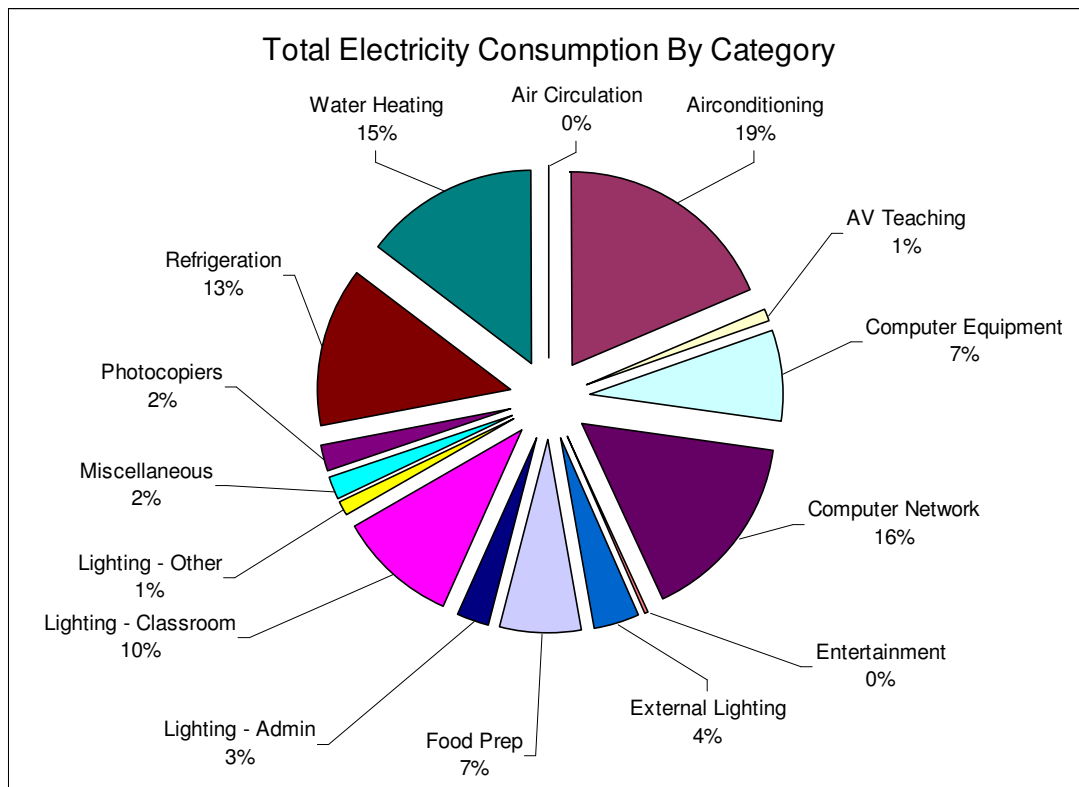
Findings

Estimated Carbon Footprint

From your electricity accounts we have estimated that the schools total carbon footprint generated by electricity consumption is approximately **232 tonnes** annually. This figure could be reduced by approximately one third by simple policy changes and staff/student involvement.

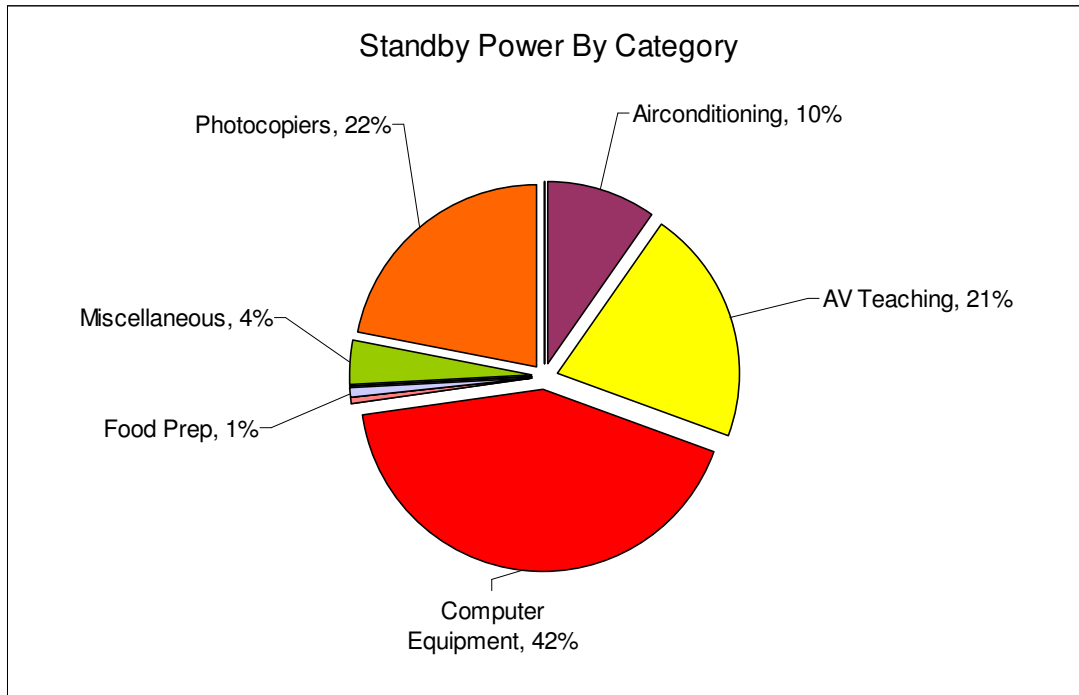
Electricity Usage

Some categories stand out in regards to high electricity usage, one of the most obvious is air-conditioning which accounts for 19% of the schools electricity consumption. Estimated electrical consumption per category is summarised in the pie chart below as a percentage of total use.



Standby Power

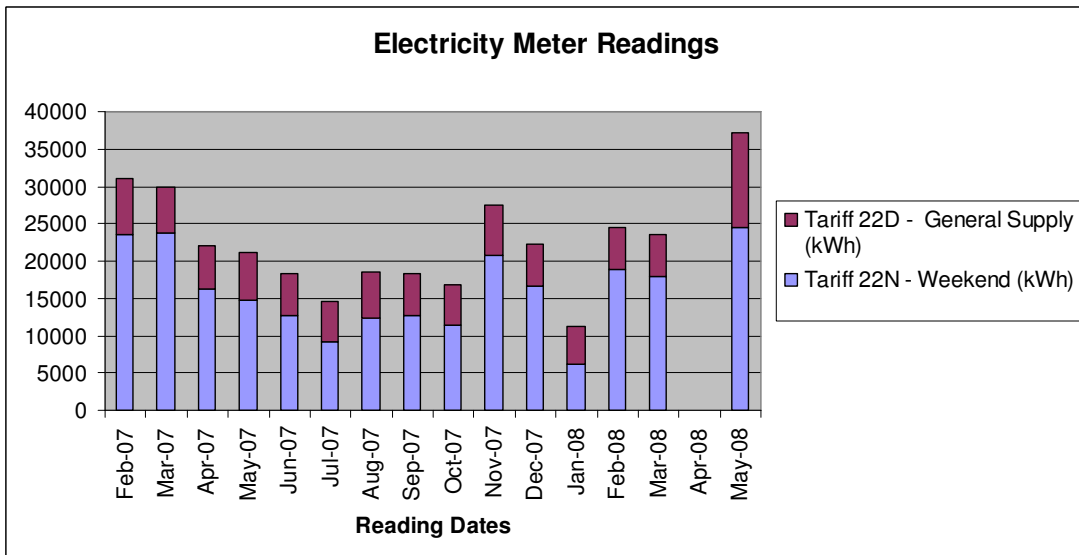
Within each category there is a significant amount of energy wasted through devices that consume electricity while they appear to be turned off. This is known as “Standby Power” and totals approximately 6% of the schools total energy consumption. A breakdown of appliances that are consuming large amounts of standby power is illustrated in the pie chart below. Of special significance is the computer equipment which is generally left plugged into the outlet when not in use.



Seasonal Trends

From the meter readings for the last 16 months we have ascertained there to be high dependency on air conditioning during the summer months while the slight peak during winter also indicates some heating is also used this is consistent with staff survey results.

The low usage during January 2008 is an accurate representation of the schools electricity usage when unoccupied.



Immediate low cost Recommendations

An immediate reduction of electricity consumption can typically be seen by simply implementing energy policies or guidelines within the school. The following low cost recommendations could be used to formulate procedures which can be adopted by staff and students.

Raise air-conditioning temperature and use ceiling fans:

Most air-conditioners were found to be set to approximately 22°C which is a temperature that is far too low for the unit to be able to maintain. Air-conditioners run more efficiently when set to 24°C and turned on earlier in the day rather than turning the unit on when the area is already hot. The room temperature will be more evenly distributed by running the ceiling fans at their lowest speed while the air-conditioners are running. This combination is most suited to the classrooms and should reduce running costs by approximately 10 - 20%.

Minimising standby power:

All computers, monitors and printers should be turned off when not in use and where possible switched off at the power point. We have estimated that 28% of the energy used by the "Computer Equipment" category was for standby power. This wasted energy can be reduced by simply switching off the power point the equipment is connected to at the end of the school day.

Reassessing the computer network:

The computer network consumes approximately 15% of the schools energy. Most of its energy is consumed by the server and dedicated air-conditioner located in the Resource Centre. While this room is shut up all day there is still the opportunity for energy savings by increasing the temperature setting for the air-conditioner and thereby reducing energy consumption.

By consulting with the IT professional who manages the system you may be able to determine how much of the network system could be switched off during school holidays and/or weekends.

Electrical Recommendations

Electric Hot Water Systems:

The current electric hot water systems located within the prep, admin and tuckshop are simple electric element systems that together consume 12% of the sites electricity. Electric heat pumps or solar hot water systems are an efficient alternative and would reduce the electricity consumed for water heating by up to 50%.

Water Cooler Fountains:

The four water cooler fountains located at the classrooms consume approximately 3.5% of the schools electricity. While they appear to be operating correctly most are located in positions where their efficiency is negated by direct sunlight.

To increase efficiency we recommend either increasing shading or relocating the units to sites where they are shaded throughout the day in winter and summer. To reduce their consumption even further we recommend changing their power circuit to a timed circuit to ensure they are powered down at night, on weekends and during holiday periods. If adopted these changes could reduce their consumption by approximately 50%.

External Lighting:

The external lighting circuits are made up of 70 fluorescent lights that automatically switch on between dusk and dawn every night. Most of these lights illuminate walkways around the school and while they provide a necessary security deterrent their light is mostly wasted. To reduce wasted energy we recommend installing automatic proximity sensors to switch 75% of these lights on when visitors are on site. To ensure security within the school the lights at the end of walkways should remain unchanged. If adopted this change could reduce the external lighting consumption by approximately 70%.

Skylights:

To increase natural light in work areas we recommend the installation of high efficiency skylights that incorporate solar reflectors and/or concentrators. The staffroom would benefit the most from this as there are currently up to 72 lights operating throughout the day while the resource centre and upper classrooms in blocks 4, 6, 7, 8 & 9 would also benefit from skylights.

Replace Desktop Computers with Laptops:

There are currently 81 desktop computers and 64 laptop computers in use within the school that consume 5.8% and 0.8% respectively of the total electricity usage. During testing we found that the laptop computers consume approximately 28 Watts per hour while the desktop computers including monitor consume approximately 130 Watts per hour. This large consumption by the desktop computers is partially due to the use of old style CRT monitors. A trend to phasing out CRT monitors and replacing desktop computers with laptops would considerably reduce energy consumption.

A Summary of Recommendations

| Recommendation | Possible savings / year |
|--|-------------------------|
| Advise staff to change air-conditioning habits and use air-conditioners in conjunction with ceiling fans. | 8,300 kWh |
| Advise staff to unplug electrical appliances when not in use. Consult with IT professional with regards to computer standby power. | 11,200 kWh |
| Consult with IT professional about powering down some of the network equipment during school holidays | Unknown |
| Consult with IT professional about reducing running costs of server and cooling system. | Unknown |
| Arrange for quotations for the installation of solar hot water systems or heat pumps for water heating. | 16,600 kWh |
| Arrange for quotations for moving existing chilled water fountains to fully shaded areas. | 3,900 kWh |
| Arrange quotations for installing a timed circuit to the chilled water fountains. | |
| Arrange quotations for installing movement sensors to lighting circuits. | 6,200 kWh |
| Arrange quotations for installing high efficiency skylights to the staffroom, upper classrooms and prep. | Unknown |
| Consult with IT professional and staff regarding reducing use of desktop computers and removing CRT monitors from service. | Unknown |
| Total Possible Energy Savings | 46200 kWh |
| Percent of total consumption | 21% |
| Total Possible CO2 Savings | 43 tonnes |