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ENERGY SAVER

Registered clubs toolkit

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1. Introduction

Clubs play a significant role in the NSW community. There are more than 1400 registered clubs in NSW, with a total of 5.7 million members, which directly employed over 40,000 people. The clubs sector is also a significant user of energy. It is estimated the clubs sector in NSW consumes approximately 2.5 million GJ of energy each year, costing around $70 million.

Energy prices play a significant role in the cost structure of individual clubs, with some larger clubs now spending well over $1 million a year on energy bills. Understanding and managing energy costs will become even more important with any future increase in the price of energy.

The Energy Saver Registered clubs toolkit is intended for senior managers, facilities managers and operations managers in the clubs sector. It will help them identify and understand the potential savings and costs associated with energy-saving projects. Board members of facilities may also find it useful in understanding what drives the energy consumption of their club and to identify the total energy savings that may be possible for their facility.

The NSW Office of Environment and Heritage (OEH) Energy Saver program has developed this toolkit to help your club:

- understand the drivers of energy use
- recognise seasonal and daily energy use cycles
- identify key areas for improvement
- identify appropriate energy efficient technologies
- understand how much energy-saving initiatives cost and their likely return on investment.

An energy efficiency checklist has also been included in Section 6. This can be used as a quick guide to carry out your own site inspections and focus on the key areas where energy can be saved. Details of how to improve the energy efficiency of these areas is outlined in Section 4.

Where appropriate, additional technical support should be considered, including whole of site or technology specific energy audits.

Benefits of energy efficiency

- Reduced operating and maintenance costs.
- Reduced system and equipment failure.
- Improved indoor environment and air quality and increased member comfort.
- Enables cost savings to be used elsewhere in the business.
- Lower energy consumption and carbon emissions.

Energy Saver program

The OEH Energy Saver program provides services to assist businesses in NSW to reduce their energy consumption and costs.

Energy Saver provides technical and project support, resources and training to assist businesses to identify and implement energy savings.

Contact the Energy Saver team to find out how we can assist you.

Email: energysaver@environment.nsw.gov.au

Phone: 1300 361 967

Web: www.environment.nsw.gov.au/sustainbus/energysaver

2. Energy consumption in clubs

2.1 Energy audit review

The Energy Saver Registered clubs toolkit is based on analysis of energy audits for 21 registered clubs in NSW conducted through the OEH Energy Saver program.

These audits represent a cross-section of facilities, with clubs of different sizes, opening hours and geographic location (see Table 2.1). Despite this diversity, there were many common areas where energy saving opportunities were identified.

This toolkit looks at areas where energy can be used more efficiently and provides a range of solutions and their associated costs and savings. Key strategies include:

- upgrading to more energy efficient lighting types
- improving performance of existing HVAC systems
- using sensors and timers for infrequently used areas
- switching off gaming machines when not in use.

Opportunities

In total the Energy Saver audits for clubs found annual cost savings of over $2.8 million per annum, with an average payback period of just 2.6 years. On average, if clubs implemented all opportunities, annual energy savings of approximately 17 per cent would be achieved.

Table 2.1: Summary of registered club audits

Site Characteristics	Variation
Geographic split	13 in the Sydney metro area, 8 in regional NSW
Gross floor area	971–49,100 m^2
Number of members	4,600–103,000
Percentage of gas usage	11–38%
Annual electricity consumption	564–13,127 megawatt hours (MWh)
Annual gas consumption	731–22,589 gigajoules (GJ) per annum
Electricity cost	10.1c–18.8c/kilowatt hour (KWh)
Gas cost	1.3–1.9 c/MJ

2.2 Energy management fundamentals

Successful energy management requires an integrated approach. From the beginning it is important to:

- get senior management buy-in
- understand your organisation's energy use, costs and legal obligations – this will help to substantiate your business case for projects
- get buy-in from your staff – some energy efficiency initiatives will require them to change their current behaviours
- incorporate energy efficiency criteria into your operations, maintenance, procurement, refurbishment and design practices.

Your energy management program needs long-term commitment and planning to maximise benefits and potential savings.

2.3 Energy costs

The audited clubs paid an average of 13.2 cents per kilowatt hour (kWh) for electricity with a highest rate of 18.8 cents and lowest of 10.1 cents. The average cost per mega joule (MJ) of gas was 1.4 cents, with the highest cost being 1.9 cents and the lowest 1.3 cents.

As 1 kWh equals 3.6 MJ, the average price of gas is around 2.5 times cheaper than electricity. As well as being cheaper, gas has the added advantage of releasing less than a quarter of the greenhouse gas emissions per unit of energy compared with electricity.

Electricity prices have risen significantly over the past four years and are expected to continue to increase.

The Institute of Sustainable Futures (ISF) was commissioned by the Energy Saver program to forecast future energy prices for businesses using 160 MWh to 10,000 MWh of electricity annually.

The study predicted that between 2011 and 2020 electricity prices will increase by at least 28 per cent or as much as 50 per cent. Gas prices are forecast to increase by 39 to 54 per cent in the same time period.

Only generic estimates were calculated, covering volume charges, which are applied per unit of energy consumed. These calculations do not include demand charges.

Your club's electricity bill

All clubs participating in the Energy Saver program had time of use (TOU) charges and capacity charges as part of their electricity bill. Under TOU charging, different rates apply for energy use during peak, shoulder and off-peak times throughout the week. A typical breakdown of the hours for the different TOU charges is outlined in Table 2.2 below.

Table 2.2: Typical breakdown of TOU charges

Charge type	Weekdays	Weekends
Peak	7.00 – 9.00 am and 5.00 – 8.00 pm	N/A
Shoulder	9.00 am – 5.00 pm and 8.00 – 10.00 pm	N/A
Off-peak	10.00 pm – 7.00 am	All day

Energy charges can vary significantly depending on what time of day they occur. There are variations to these times for different energy retailers, so it is important to check the times that are applicable to your club. Electricity charges in the audited clubs varied from as high as 23.8 cents per kWh for peak to as low as 4.8 cents per kWh for off-peak.

Capacity or demand charges (measured in kilovolt amps or kVA) are based on a club's maximum demand for electricity, usually measured over 15-minute or 30-minute intervals. This is commonly known as peak demand. Often a club will be charged for this maximum demand every month for the next 12 months after the maximum demand event occurs. In many instances this can be very expensive, with the capacity charge accounting for around 25 per cent of energy costs for some audited clubs. There are three key strategies you can use to reduce capacity charges.

Strategies for reducing capacity charges

1. **Spread electricity consumption throughout the day**

   Turning all equipment on at once could increase your peak demand charges, so look for ways to spread out the load throughout the day. Staging the switching on of major equipment and scheduling non-essential operations for off-peak times are effective strategies to lower your capacity charges and can also allow you to take advantage of cheaper off-peak rates as well.

2. **Install power factor correction**

   Power factor is a measure of how effectively electricity supplied from the grid is used by the facility. A power factor approaching 'one' means that there is little or no wastage of the supplied electricity. Improving the power factor during periods of maximum demand has the potential to significantly reduce electricity demand costs. Power factor correction equipment (capacitor banks) can be installed on supply points to improve a site's power factor when it is suboptimal. Power factor is measured on a scale between zero and one, with a value of one being the theoretical maximum value. A power factor of greater than 0.97 is generally regarded as good.

   Most audited clubs had a very good power factor of close to one, requiring no action. However, a number of smaller clubs had a power factor of 0.92 or below, which was the point at which installation of power factor correction equipment became economically viable. Power factor must also be kept over 0.9 to conform to electricity network rules.

   Payback periods for installing power factor correction ranged from three to five years. Capital costs ranged from $5000–$15,000, with cost savings of up to $5000 per year from this initiative. Please note that capital costs for power factor correction are proportional to peak demand and therefore may be greater for clubs with high levels of energy consumption.

3. Reduce energy consumption generally

Energy efficiency projects often focus on reducing energy consumption. However, in some instances these strategies will also reduce your capacity charges as well, by reducing your peak demand. Therefore energy efficiency projects that focus on reducing energy use during peak times are particularly effective and are the best strategy for reducing your capacity charges even further. An example of this is the installation of more efficient lighting that operates for the majority of the day.

Next steps

- Find out more about energy price rises and how they relate to your organisation in the ISF report: **www.isf.uts.edu.au/publications/Isonetal2011energypricesto2020.pdf**
- Forecast your own energy price rises using the online calculator: **www.isf.uts.edu.au/publications/energypriceprojection.xlsx**
- Learn how to read your energy bills and track your demand (kVA) through the OEH Energy Management Basics training course: **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm**

2.4 Energy use breakdown

Figure 2.1 below gives a breakdown of average club energy use and shows that heating, ventilation and air-conditioning (HVAC) systems are the highest users of energy. Across the audited clubs, an average of 44 per cent of all energy was used by HVAC systems to keep the club at a comfortable temperature for patrons. Significant amounts of energy were also consumed in lighting and gaming. These three uses accounted for 73 per cent of overall energy use.

While electricity was the most common energy type for cooling, either electricity or natural gas was used for heating. Natural gas was also used for catering and domestic hot water. This breakdown excludes clubs with a swimming pool, which accounted for approximately 10 per cent of energy use in these clubs.

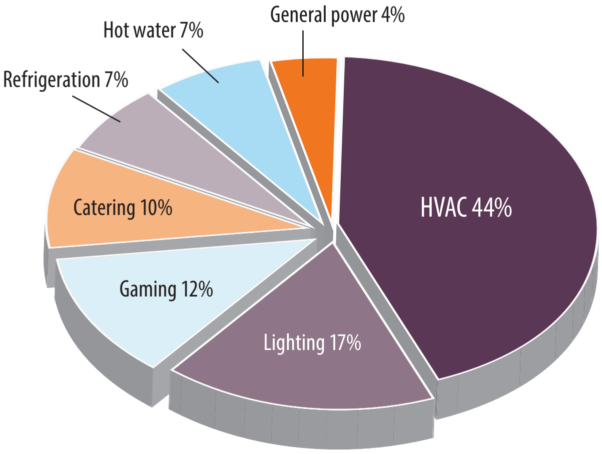

Figure 2.1: Typical breakdown of club energy use

2.5 Daily use patterns

Although there were variations in the shape of the electricity demand curve over the course of the day, many clubs exhibited a similar trend to that shown in **Figure 2.2**. Clubs are typically open long hours, with electricity being used continually for some tasks. The baseload consumption for audited clubs varied widely, but was often about half of the day-time peak demand. In many clubs, the baseload electricity consumption was at least partly due to gaming machines being left switched on overnight.

Typically, demand rises steeply in the morning when the club opens to the public. This often coincides with start-up of HVAC equipment, switching on lights and staff preparing the club for opening.

Winter electricity demand was generally lower than summer demand. This was mostly due to a higher summer electricity load for air conditioning and refrigeration systems.

Switching off equipment that is not needed overnight can significantly reduce baseload consumption, without impacting patrons.

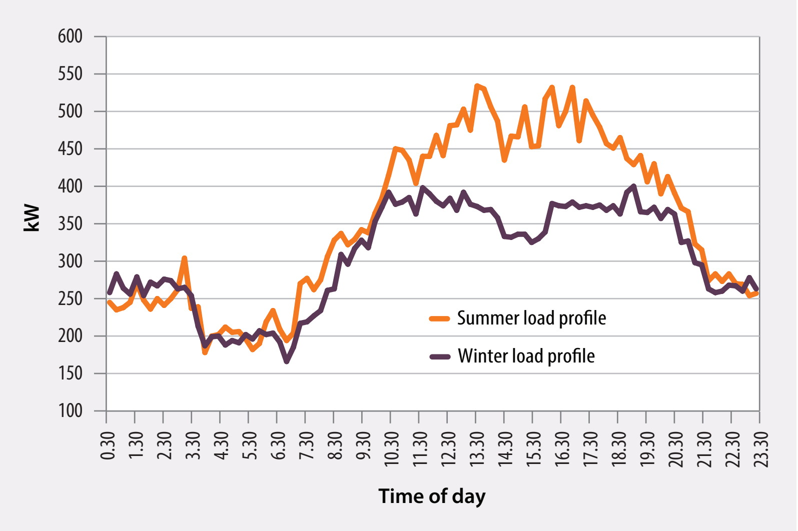

Figure 2.2: Typical daily electricity use patterns

Next steps

- Contact your energy supplier to obtain your electricity meter interval data. This includes consumption (kWh) and load (kVA). Ensure when renewing your electricity contract that the retailer will provide the club with on-line access to your 30-minute electricity data.
- Download the California Commissioning Collaborative free download (Excel Add-In) tool that can simplify the analysis of interval data. For more information, go to **www.cacx.org/PIER/ecam/**

How to analyse your interval data

- Examine your data over the course of a typical day and a typical week in both summer and winter. Compare your energy consumption between days with normal operating hours. Are there any anomalies? For example, is your facility consuming energy in the middle of the night when everything should be idle? Often equipment such as lights, ventilation and gaming machines are left on overnight when a club is closed.
- Look at the profile of your energy consumption. Are there any unusual peaks in consumption? Can these be explained? Unexpected peaks could be due to a range of factors. In some cases, the cause can be traced to improperly programmed building management systems (BMS) that automatically turn equipment on and off.

There are many different ways to deal with the types of problems that may be identified from analysing interval data.

- **Review BMS schedules**
  If your facility operates under a central building control management system, carefully check over all schedules to make sure they are not in conflict with one another or improperly programmed.
- **Install occupancy sensors or timers**
  Often a more effective way to ensure equipment and lighting is not left running overnight is to install occupancy sensors or timers.
- **Reschedule activities that occur at the same time**
  High peak demands are caused by equipment running concurrently at full load. A typical situation might be a hot summer day, where cooling, refrigeration, internal lights and cooking equipment are all running at the same time. Consider whether you are able to reschedule some activities to prevent them all occurring at the same time.

  An example might be to switch off refrigeration systems temporarily, using the thermal inertia of the cool room to hold the temperature at a reasonable level over the hottest time of the day.

  Or if you know it's going to be a very hot day, one option is to lower the temperature of the cool room overnight to extend the length of time that you can shut it down during the day, but you must then remember to adjust it back to its normal temperature once the outside temperature drops. Note that this will not reduce energy consumption, but if executed properly it may reduce peak demand charges.
- **Train people to turn equipment off at the end of the day**
  If energy consumption appears higher than usual outside operating hours, investigate whether people are neglecting to turn equipment off when they leave for the day. Typical examples include lights, office equipment and air conditioners – particularly packaged units and split systems that operate independently of a central BMS.

3. Energy benchmarks and potential savings

3.1 What drives energy consumption?

As outlined in **Section 2.4**, around three quarters of total energy use in clubs is consumed by HVAC, lighting and gaming machines. The balance is consumed by catering, refrigeration, hot water and general power. Energy use in clubs is predominantly driven by the following four factors:

- colder outside temperatures require energy for heating (generally from gas)
- hotter outside temperatures require energy for cooling (generally from electricity)
- floor area and opening hours determine the energy requirements for lighting
- patronage numbers require energy for catering and hot water.

Energy use in clubs is therefore mostly determined by a combination of floor area, opening hours and patronage numbers, (which are not dependent on climate), with additional electricity use driven by hot outside temperatures and additional gas use driven by cold outside temperatures.

OEH analysis found that measuring a club's energy use compared with their floor area was the most useful Key Performance Indicator (KPI) to track energy performance. The correlation between energy use and floor area was reasonably good for smaller clubs, but larger clubs have higher levels of variation from the predicted consumption levels. This variation was primarily driven by the bigger variety of services generally offered at larger clubs. **Figures 3.1** and **3.2** show this correlation for electricity and gas use respectively.

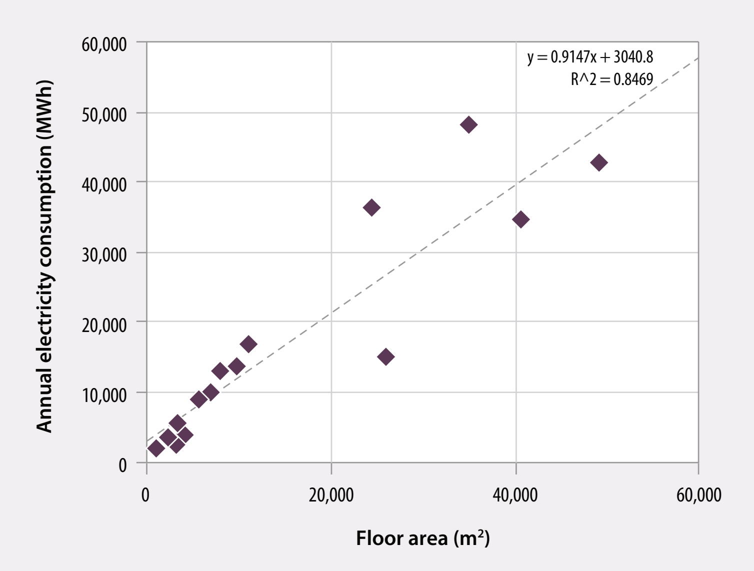

Figure 3.1: Annual electricity use*

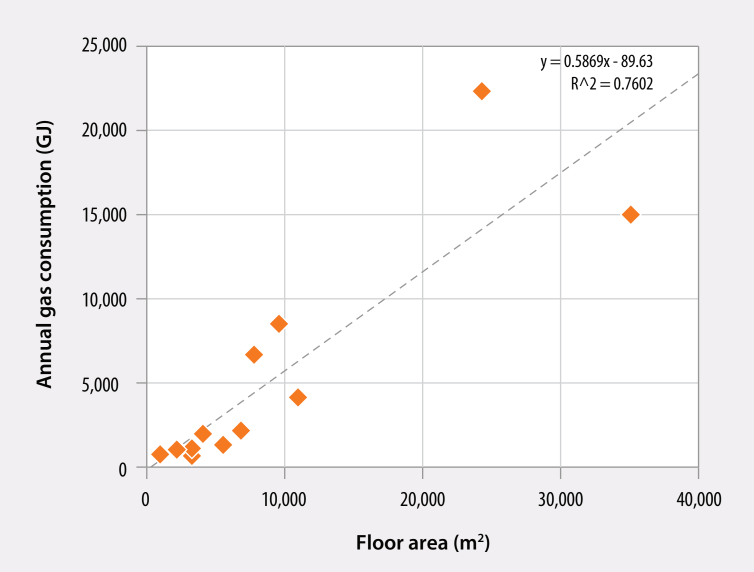

Figure 3.2: Annual gas use*

* Full data sets were not available for all clubs

3.2 Benchmarks

Benchmarking allows comparisons of the energy efficiency performance of your club with that of other clubs. As highlighted in the previous section, average use by floor area provides a useful benchmark. Table 3.1 below summarises the performance across the 21 audited clubs.

Table 3.1: Breakdown of electricity and gas consumption per square metre

	Electricity	Gas
Average use	0.37 MWh/m^2	0.52 GJ/m^2
Lowest use	0.16 MWh/m^2	0.21 GJ/m^2
Highest use	0.58 MWh/m^2	0.92 GJ/m^2

As discussed previously, this comparison is more useful for smaller clubs. Once a club exceeds 10,000 m^2, other factors have a greater impact on energy consumption, making these measurements less useful.

Tracking your club's energy usage over time is also critical. A downward trend in energy usage per square metre is an excellent sign that your energy performance is improving.

3.3 Energy savings

Typical site savings of more than 17 per cent have been found through the Energy Saver Program. Table 3.2 identifies the level of savings versus their 'payback' period. Payback is how quickly the project pays for itself in the form of reduced energy bills. Overall site savings were eight per cent if all projects with under a two-year payback were implemented and 11 per cent for those under a three-year payback.

Table 3.2: Total energy savings by payback period

Payback period	< 2 years	< 3 years	< 5 years	< 10 years
Site energy savings	8%	11%	15%	17%

The savings were all calculated using current energy prices for comparison purposes.

Tip

Keep in mind that future energy price increases will reduce the payback period for energy saving projects.

Be the leader

Achieving energy savings requires strong leadership. Ideally this should be driven by the management team or at board level.

Demonstrate this commitment through:

- endorsing an energy policy with targets and actions
- encouraging staff involvement
- publicising your achievements and generating a positive image for your staff, members, visitors and the local community.

Case study: Mittagong RSL

The Mittagong RSL Club building began life as a function centre in the late 1960s. The club moved into the premises in 1976. Today the club has 125 employees and its facilities include a 380-seat auditorium, 160-person capacity function rooms, the Springs Restaurant and the Homestead Bistro.

Following the Energy Saver audit in early 2010, the club has implemented seven energy saving opportunities at a total cost of $436,000. 'These initiatives have enabled us to reduce our energy consumption by around 25 per cent,' says Mittagong RSL Club General Manager Craig Madsen. 'Our energy contract came up for renewal recently and our power costs increased by 22 per cent. So these changes have meant we were able to keep a lid on our power costs and even save some.'

Mittagong RSL's improvements ranged from relatively simple projects, like replacing energy inefficient lights (e.g. halogens with LEDs) and de-lamping over-lit areas, to a major upgrade of the club's heating, ventilation and air-conditioning (HVAC) system.

As part of the HVAC upgrade, two water-cooled air-conditioning cooling towers were replaced with an air-cooled system and 14 refrigeration compressor motors with a single rack compressor at a cost of $365,000 and a payback period of six years.

Summary of results

- Reduction in power consumption of 25 per cent.
- Estimated annual savings of $130,000 (at 2010 electricity prices).
- Average payback period of 3.3 years for all projects.
- Annual reduction in carbon pollution of more than 750 tonnes.

3.4 Funding energy savings projects

Energy Savings Certificates

Project costs can be reduced if your energy efficiency project is eligible to generate NSW Energy Savings Certificates (ESC).

You can transfer your project's electricity savings to an Accredited Certificate Provider (ACP) who will create ESCs on your behalf and then register and trade them.

One ESC is equivalent to one tonne of carbon dioxide equivalent saved. Determining the number of certificates varies depending on the technology used to save the energy and because savings can be brought forward, in some instances up to 10 years. The ACP will undertake these calculations for you. They may also require data logging or meter data to monitor and verify the savings.

The price of a certificate is open to market fluctuations and the ACP will negotiate with you a proportion of these costs to cover their expenses.

Please note that projects must be located in NSW to be eligible for ESCs.

For information and to apply:

Phone: (02) 9290 8452

Email: ess@ipart.nsw.gov.au

Web: www.ess.nsw.gov.au

List of Accredited Certificate Providers: **www.ess.nsw.gov.au/Overview_of_the_scheme/List_of_Accredited_Certificate_Providers**

Environmental Upgrade Agreements (EUAs)

EUAs can make it easier to access finance for environmental improvements to existing buildings in NSW. Under this agreement, a finance provider lends funds to a building owner for energy, water, and other environmental upgrades, and this low-risk loan is repaid through a local council charge on the land.

To learn more about EUAs visit: **www.environment.nsw.gov.au/sustainbus/energysaver/eua.htm**

Clean Energy Finance Corporation

Another source of funding from a government body for your energy savings projects is the Clean Energy Finance Corporation. It is important to stay up to date with the latest information, please check their website regularly to see if any funding is currently available for your club.

Clean Energy Finance Corporation
www.cleanenergyfinancecorp.com.au

4. Opportunities for energy savings

4.1 Heating, ventilation and air conditioning

Heating, ventilation and air conditioning (HVAC) accounts for the largest portion of energy use at clubs. The average energy use by HVAC systems for the audited clubs was 44 per cent, with one club being as high as 65 per cent. Key opportunities are listed in Table 4.1 below.

Table 4.1: HVAC energy and cost savings

Measure	Cost	Annual savings	Payback period
BMS Upgrade	$4,000–$70,000	Typically 5–20% of total HVAC energy use	< 1 year to 4 years
Motion sensors for outdoor heaters	$5,000–$20,000	Typically up to 10–15% of total HVAC energy use	< 1 year
Installation of variable speed drives (VSDs)	$6,000–$30,000	Typically up to 5% of total HVAC energy use	< 1 year to 9 years
Adjust HVAC setpoints/use of timers	$1,000–$4,000	Typically 5% of total HVAC energy use	< 1 year to 2 years
Modify kitchen exhaust systems	$1,000–$17,000	Typically up to 3% of total HVAC energy use	1–4 years
Modify toilet exhaust systems	$5,000–$10,000	Typically 1% of total HVAC energy use	3–5 years

HVAC systems in clubs often evolve over many years, following renovations and additions. In many instances this can result in inefficiencies. Generally, clubs use a centralised air-conditioning system, with heating coming from gas fired boilers. Additional ventilation occurs in toilets, kitchen and car park supply and exhaust systems.

Large upgrades of HVAC systems in clubs can be expensive, but can also deliver significant energy savings. Upgrading systems can also address the issue of previous systems being added on during renovations, delivering a more energy efficient solution. This will often deliver improved thermal comfort levels for patrons and staff.

There are also a number of low and no-cost opportunities to improve the performance of your HVAC system, which can also significantly improve your system's efficiency.

Temperature setpoints

A temperature setpoint is the desired temperature level within a building or area. The further the pre-existing air temperature inside a building is from the setpoint, the harder an air conditioner has to work to reach it. For example, on a hot day the cooling requirements for a building will be much greater than normal and the air-conditioning system will consume a greater amount of electricity to maintain the temperature setpoint. Changing the temperature setpoint by 1 °C reduces or increases energy consumption of cooling or heating equipment by around 10 per cent. Setpoints should be adjusted seasonally to improve efficiency further.

Building management systems

Most clubs have a building management system (BMS) which controls all or part of the club's HVAC system. The functionally of a BMS varies, but usually allows for control of setpoints, start/stop times, use of economy cycles and the reporting of energy use. Optimising and upgrading a club's BMS is an important energy saving measure and can reduce HVAC energy use by up to 20 per cent. The capital cost of upgrades varies significantly, but payback periods are typically under four years.

Economy cycles

An economy cycle on your air-conditioner draws in outside air to cool down the internal building when the outside temperature is cooler than it is inside. Most HVAC systems have an economy cycle, but many Energy Saver audits found they were not used effectively.

Clubs can sometimes still be using 100 per cent outside air, which was a legacy from when smoking was permitted indoors. This practice leads to significant increases to energy use during hot and cold days, as HVAC systems are required to work harder to deliver comfortable conditions.

Talk to your BMS technician about optimising your economy cycles.

Variable speed drives

Variable speed drives (VSDs) can be attached to the motors used to run many components of a club's HVAC system, including air-handling units, pumps and fans. A VSD reduces the speed of a motor when it is not operating at 100 per cent, significantly reducing its energy consumption. A VSD reducing a motor's speed by 20 per cent will reduce the power consumption by 50 per cent.

Payback periods for VSDs vary significantly, so it is important to ensure that VSDs are only installed on equipment where this technology will be effective. Despite this, audited clubs were found to have the potential to save up to five per cent of HVAC electricity use by installing VSDs, making this an important area for consideration.

Exhaust systems

Often kitchen and bathroom exhaust systems run continuously in clubs, using significant levels of energy when they are not required.

Motion sensors are a good solution for bathroom exhaust systems. Furthermore, a single motion sensor can be used to control both lighting and exhaust systems, delivering increased savings. It is important, however, to install a sensor with the correct level of sensitivity and to ensure that lighting and exhaust systems stay on for adequate periods of time to ensure functional operation. Using motion sensors in bathrooms was found to save up to one per cent of total HVAC electricity use, with typical payback periods of three to five years.

Many kitchen exhaust systems were found to be running for up to 13 hours a day, regardless of use patterns. To address this issue, infrared sensors can be used to switch on exhaust systems only when cooking is occurring. Savings in this area were up to three per cent of total HVAC electricity use, with payback periods ranging from one to four years.

Heating

Clubs participating in Energy Saver audits used significant volumes of gas to provide space heating. Gas heaters are generally a very efficient form of heating and therefore only limited opportunities were found to reduce costs of these systems.

One important area of savings for heating was the use of motion sensors for electric outdoor heaters. Payback periods for this type of opportunity are typically less than one year and could save up to 15 per cent of total HVAC electricity use.

If your club does not currently use gas for heating, this could provide a significant energy saving opportunity. Per unit of energy, gas is around 2.5 times cheaper then electricity and also emits less than a quarter of the greenhouse gas emissions.

Considering a major HVAC upgrade?

Contact the Energy Saver team to register for HVAC training at **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm**

Economic life of equipment

Being aware when HVAC equipment is coming to the end of its economic life can lead to significant energy savings. When replacing HVAC equipment, calculate the total cost of ownership over its economic life. In many cases, an energy efficient option is also the cheapest when running costs are also taken into consideration.

It is also important to remember that older and outdated equipment can also have high maintenance costs, which can be significantly reduced by selecting newer, more energy efficient options.

The life expectancy of HVAC equipment varies due to a wide number of factors, including the brand of equipment, operating hours and frequency of maintenance. **Table 4.2** below gives a guide to the expected life of some common types of HVAC equipment in clubs.

Tips

- Speak to a reputable air conditioning specialist to optimise the use of your HVAC economy cycle and the volume of outside air used.
- Timers can be used to limit operating times of air conditioners servicing common areas.
- Start and stop times for air-conditioners can be optimised to reflect outside and inside air temperatures, rather than turning them on at a fixed time all year round.
- Make sure temperature sensors are located centrally within a room to provide a representative temperature, not blocked by furniture or placed by entry ways.
- Motion sensors can be used to regulate the operation of lighting and other equipment in areas that are used infrequently or only at certain times of day.
- Ensure all piping, ductwork and vessels are insulated to reduce heat loss and heat gain.

Table 4.2: Average life expectancy for HVAC equipment

Equipment type	Approximate economic life
Kitchen hood grease filters (with monthly cleaning)	3–6 months
Disposable dry media air filters	6–18 months
Package or split air conditioning unit (10–100 kW)	10–15 years
Cooling towers	10–25 years
Fans	15–20 years
Variable air volume (VAV) – terminal units	15–25 years
Boilers Chillers	15–30 years
Electric motors Heat exchangers Pipe work and valves Pumps Cooling and heating tubes Automatic controls and instrumentation	20–25 years
Ductwork and fittings Damper motors (inc. VAV controllers)	20–30 years
Evaporative coolers	25–30 years

Site renovations

Renovations or extensions to clubs provide excellent opportunities to improve overall energy efficiency.

- Old or inefficient equipment can often be easily replaced during renovations. Capital costs can often be absorbed into the renovation project budgets and disruptions to patrons can also be minimised.
- Consider utilising or upgrading existing equipment, rather than simply purchasing new equipment for refurbished areas. For example, adding a new smaller air conditioner can often 'fight' with the existing HVAC system, leading to inefficiencies and additional running costs.
- Consider the full lifecycle cost of new energy using equipment purchased. Selecting a cheaper, but less efficient unit is likely to increase the total cost of ownership by many times.

4.2 Lighting

Lighting consumes an average of 17 per cent of a club's total energy consumption. This relatively high level of energy consumption is driven by the long operating hours in most clubs. This is also a significant advantage when investing in energy efficient lighting solutions. These long operating hours mean that payback for lighting projects in clubs is generally much lower than for many other types of business.

There are various strategies that can be employed to increase the energy efficiency of lighting, which are discussed below and outlined in **Table 4.3**. Lighting technology is always in development; please refer to the Energy Saver lighting technology report for more information: **www.environment.nsw.gov.au/sustainbus/energyefflight.htm**

Table 4.3: Lighting upgrade energy costs and savings

Preferred option	Existing lamp type	Energy-efficient option	Typical costs	Energy savings and benefits
✔	Twin 36 W T8 fluorescent tube	Replace complete fitting with louvered fitting with twin T5 lamps and an electronic ballast	Lamp cost $15 a pair plus new fitting and installation cost of $85	▪ 30–40% savings of lighting energy ▪ Simple payback 3–5 years* ▪ Lamp life of 16,000–20,000 hrs ▪ Typical efficacy of 75 lumens/watt
✔	Twin 36 W T8 fluorescent tube	Replace complete fitting with high-efficiency luminaire containing single T5 lamp	Lamp cost of $7.50 plus new fitting and installation cost of $145	▪ 60–67% savings of lighting energy ▪ Simple payback 1–3 years* ▪ Lamp life of 16,000–20,000 hrs ▪ Typical efficacy of 85 lumens/watt
	Twin 36 W T8 fluorescent tube	Replace lamps with T8 to T5 conversion kit	Lamp cost of $15 a pair plus conversion kit and installation cost of $80	▪ 20–50% savings of lighting energy ▪ Simple payback 2–3 years* ▪ Lamp life of 16,000–20,000 hrs ▪ Typical efficacy of 75 lumens/watt
	Twin 36 W T8 fluorescent tube	Replace lamp with 24 W LED tube	Lamp cost of $140 a pair plus fitting and installation cost of $160	▪ 50–70% savings of lighting energy ▪ Simple payback 4–6 years* ▪ Lamp life up to 50,000 hrs ▪ Risk of poor quality product and low light levels[#] ▪ Typical efficacy of 65 lumens/watt
✔	50 W halogen	Replace complete fitting with 16 W LED and new power supply	Lamp cost $70–120 plus new fitting and installation cost of $80	▪ 60–80% savings of lighting energy ▪ Simple payback 1–3 years* ▪ Lamp life 30,000–50,000 hrs ▪ Reduces heat load and fire risk
	50 W halogen	Replace lamp with 10 W LED	Lamp cost $20–$80 and installation cost of $60	▪ 60–80% savings of lighting energy ▪ Simple payback 1–2 years* ▪ Lamp life 10,000–50,000 hrs ▪ Reduces heat load and fire risk ▪ Risk of poor quality product
	50 W halogen	Replace lamp with 35 W IRC halogen	Lamp cost of $12 with installation cost of $12	▪ 30% savings of lighting energy ▪ Simple payback <1 year* ▪ Lamp life up to 6000 hrs ▪ Same fire risk as halogen

✔ These options are preferred for upgrading fluorescent twin 36 W troffers. These upgrades will provide brand new, fully compliant luminaires that should deliver good energy reductions. These are low-risk options and minimal design verification is required.

✔ This option is preferred for replacing 50 W halogen lights as it will deliver excellent energy reductions while providing brand new, fully compliant luminaires. Minimal lighting design verification is required and there is minimal risk in its selection and implementation. Using good quality products is an essential element of minimising risk.

* Payback periods based on 50 hours / week use. Payback periods will generally be shorter for clubs with longer operating hours.

[#] Risk can be reduced by selecting well-known international brands.

Replace T8 fluorescents

T8 fluorescent lights can be upgraded to T5s. T5s use slightly thinner and shorter lamps with different pin spacing and require electronic control equipment. There are two upgrade options: replacing either the whole light fitting or just the T8 lamp with a T5 upgrade kit. The latter option uses the existing light fitting and components and should only be undertaken if they are in good condition. Apart from using less power, the T5 electronic control equipment avoids flicker and improves lamp life. However, T5 lamps are not effective in external areas (such as car parks) as their light output drops in colder temperatures.

When replacing the whole fitting, a new luminaire containing two T5 lamps can be used or a single T5 lamp within a high performance reflector fitting can be selected. The design of this fitting provides increased reflection of the light which gives a similar light output to two T8s. Although these fittings are more expensive, they provide around 60 per cent energy savings.

There are also a large variety of light emitting diode (LED) linear tubes on the market as replacements for T8 lamps. These have varying performance and quality issues. Less light is produced by LED tubular lamps than by T8 lamps and most of the light produced by an LED lamp is projected forward. LED lamps will therefore light the space differently than the existing system and should be carefully considered if you have concerns with maintaining lux levels. Once again, this option re-uses lamp holders and cables and the condition of this old equipment should also be taken into account before replacement.

Replace halogens

LED lights are suitable replacements for 50 W or 35 W halogen lamps. LED lights generate very little heat and can reduce the fire risk associated with halogens, as well as reducing the cooling load on air-conditioning systems.

10 W LED lamps are available as a simple bulb replacement for 50 W halogens. However, their light output will be lower and the better option is to install a new 16 W LED lamp, which completely replaces the existing light fitting and power supply with new components that are designed to work together. Replacing the entire light fitting is more likely to achieve the same lighting effect as the existing halogen.

Other lighting solutions

In addition to upgrading lamps and light fittings to more efficient types, there are other strategies that can be used to improve the energy performance of lighting within your club. **Table 4.4** below highlights some key opportunities identified in the Energy Saver club audits.

If there are excess lighting levels in your club, then delamping can be a very effective strategy, with little or no cost. Similarly, using dimmers can also be a very effective method to save electricity. For example, in an open plan environment, dimming lights in areas with significant natural light will save energy, but preserve the ambience for patrons in adjoining areas. Before using either of these strategies, it is important to check that light levels comply with Australian Standard 1680.1. **Table 4.5** gives further details.

Using sensors and timers can eliminate energy use when lighting is not required in an area of your club. Utilising sensors and timers in toilets, function rooms, offices and back of house areas can be very effective. Motion sensors can be used for indoor areas, while photoelectric sensors, which switch lights on when natural light levels drop below a certain level, can be used for outdoor lighting and areas which receive large volumes of natural light. This technology has advanced significantly in recent years.

Voltage reduction units can be used to reduce the energy consumption of fluorescent tubes. These are effective when magnetic or conventional ballast is used and the light fittings are in new condition. Voltage reduction units reduce lighting levels by around 10 per cent, so it is important to ensure adequate lighting levels are maintained.

Upgrading emergency lighting to LEDs is an additional energy saving initiative. Over a whole club, the energy use of emergency lighting can be significant as they must be on all the time. There are two broad strategies that can be used to complete this upgrade. Firstly all emergency lighting can be replaced at the same time, possibly as part of a larger lighting upgrade. Alternatively LED lights can be installed as current lamps fail. This staged approach can be effective for clubs with tighter capital constraints.

Tip

Don’t forget back of house areas in your plans to improve the energy performance of lighting. Upgrading to more efficient technology, sensors, timers and delamping can all be very effective strategies.

Table 4.4: Lighting optimisation energy and cost savings

Measure	Cost	Annual savings	Payback period
Motion sensors and timers	\$2,000–\$20,000	Typically up to 10% of total lighting energy use. Can be higher for smaller clubs	1–5 years
Voltage reduction units	\$10,000–\$50,000	Typically around 1% of total lighting energy use	3–5 years
Delamping and dimming	\$0–\$5,000	Typically up to 5% of total lighting energy use	Generally < 2 years

Table 4.5: Required lux levels under AS 1680.1

Interior space	Maintenance illuminance lux*	Notes
Foyer	160	Floor level
Reception desk	320	On working surface
Loading bays	80	Adequate illumination also required on vertical surfaces
Corridors	40	Floor level
Stairs	80	Uniformity is important
Lifts	Special	Lift manufacturer's design
Dining room	160	Higher illuminance beneficial for cleaning. Dimming beneficial where low illuminance required for special functions
Food counter	240	
Kitchen general	160	Refer also to health and safety regulations
Kitchen food preparation, cooking, washing up	240	
Gaming machine area	Special	
Toilets	80	Avoid reflections in mirrors
Plant rooms	80	
Switchboards	160	

* These lux values are minimum maintenance illuminances that take into account the loss in light output of the lamps between replacements and also dust accumulation on the luminaire's optical surfaces plus reduction in the reflectance of ceilings, walls and floors.

LED buyer's checklist

☐ Source high quality lights from reputable suppliers.

☐ The design of the LED light needs to include a method of dissipating heat. Typically, this is in the form of a heat sink with metal fins that sit behind the luminaires.

☐ Look for evidence of lamp life testing.

☐ Ensure that the light is compliant with all applicable standards by engaging a lighting specialist to design the lighting upgrade.

☐ Install a test area and evaluate whether it meets your standards and is suitable for widespread installation (e.g. illuminance, uniformity, glare, colour).

Next steps

- Find more information about efficient lighting options in the Energy Saver lighting technology report. Available online at **www.environment.nsw.gov.au/sustainbus/energyefflight.htm**
- Use the Energy Saver Calculight tool to help you identify appropriate, cost-effective energy efficient lighting upgrades for common types of lighting. Calculight will enable you to compare lighting options and provide technical specifications to inform decision-making for your club. Available online at **www.environment.nsw.gov.au/sustainbus/energyefflight.htm**
- Learn how to undertake your own lighting upgrade step by step through Energy efficient lighting training. Visit **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm** to find the next available course.

Case study: Ryde-Eastwood Leagues Club

An Energy Saver audit helped Ryde-Eastwood Leagues Club identify options to reduce electricity use for lighting. These included replacing T8 fluorescent light fittings with T5s; installing motion sensors; replacing halogen downlights with LEDs, and installing voltage reduction units in the car park.

The club, which was founded in 1963 and now has nearly 38,000 members, has undergone a series of expansions in the past 15 years. Covering more than 25,000 square metres, its facilities include two restaurants and a cafe, five bars, a fitness centre and indoor pool, gaming lounges, function centre (including a 300-seat auditorium), two shops, and a multistorey carpark.

With an annual power bill of more than half a million dollars, the management team at Ryde-Eastwood Leagues Club is constantly looking for energy saving opportunities. And while there's no shortage of people approaching the club with proposals promising big power savings, General Manager Chris McCarthy says that sorting out which technologies will deliver proven results can be a challenge.

'The Office of Environment and Heritage's (OEH) Energy Saver program made it viable for the club to enlist the services of an independent energy consultant to help us create a plan for our lighting upgrade with all the proper checks and balances in place,' says McCarthy. 'Our auditor not only helped us to identify cost saving opportunities, but also payback periods for the recommended capital expenditure'.

McCarthy says the audit recommendations were very timely. 'Technology is moving at such a fast pace that it has become increasingly difficult to keep up with all the latest innovations when that's not your core focus. With assistance from our auditors, we've been able to ensure that our lighting system will be running as efficiently as possible at this point in time.'

Summary of results

- Cost savings of around $63,000 a year.
- Reduction of approximately 30 per cent in lighting energy use.
- Simple payback period of 2.4 years.
- Annual reduction in carbon pollution of more than 237 tonnes.

4.3 Gaming machines

Gaming machines are a significant user of energy in clubs, accounting for an average of 12 per cent of a club's total electricity use.

Many audited clubs already switched off their gaming machines when not in use; however, starting this practice was a key outcome from a number of audit reports. Switching off gaming machines for only three hours per day can reduce their energy use by approximately 10 per cent.

Payback periods for this initiative were very good, with the capital cost either being free in many cases or only requiring a small amount of investment in circuit rewiring. It is recommended to consult with your gaming machine supplier before implementing this energy saving opportunity.

4.4 Catering

Refrigeration

Refrigeration consumes around seven per cent of energy used at the average club. Refrigeration can be in the form of stand-alone refrigerators, freezers, room bar fridges, cool rooms and freezer rooms.

Maintenance of this equipment is essential to ensure it runs efficiently and the following should be carried out:

- check door seals and replace them if damaged
- put motion detectors on lights
- keep condensers and evaporator coils clean and free of dust
- replace any deteriorated condensers
- check that temperature sensors are located in an area that can provide a reliable indication of cool room temperature
- check that the temperature sensor is working correctly (either by an ice bath or with another thermometer).

Check that refrigerant levels are correct. Too little refrigerant leads to low suction pressure and long compressor run times. Too much refrigerant leads to excessive head pressure and high power consumption. As of July 2012, the cost of synthetic refrigerants increased substantially to reflect their global warming potential. This provides a disincentive to use them and is an added maintenance cost that should be taken into account when upgrading your refrigeration system.

Most commercial refrigeration systems use electric heaters to defrost evaporator coils. Check the manufacturer's recommendations to identify whether the length of the defrost cycles can be shortened or if they can be timed to defrost outside peak hours.

To increase efficiencies you can fit a VSD to compressors or fans or use electronically commutated (EC) fans. EC fans are cheaper to retrofit than VSDs and will reduce their speed when a temperature setpoint has been met. When installing refrigeration equipment for cool rooms ensure that pipework runs are kept as short as possible and that condenser units are kept in a shaded, well-ventilated area.

Purchasing decisions for kitchens

Kitchen equipment can account for 30 per cent of the energy load in a kitchen. Implementing a startup and shutdown schedule for each individual piece of equipment can save money by reducing operating and idle times as well as reducing the demand charge on your electricity bill.

When replacing your kitchen appliances, it pays to think long term. Choose gas appliances in preference to electric. A gas combi oven–steamer could save you more than $4000 in annual energy bills compared with an electric one. You can recoup the difference in the upfront cost in one to two years.

Dishwashers can also be purchased with heat recovery, reducing heating costs. They can be connected directly to your hot-water line, which saves the cost of heating the water by an electric element. If you have a dishwasher with an electric element, it's important to turn it off out of hours as it will continually maintain the boiler temperature at 85 °C whether in use or not.

Next steps

- Would you like to train your kitchen staff in energy efficiency? Find training resources here: **www.environment.nsw.gov.au/sustainbus/greenskills/enefftraining/resource/business.htm#hospitality**
- Learn more about refrigeration energy savings through the Energy efficiency in commercial refrigeration training course. Visit **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm** to find the next course available for you.

4.5 Hot water

Hot water consumed an average seven per cent of energy used across audited clubs. The majority of clubs used gas to heat hot water and these were generally found to be efficient systems. Key savings opportunities are outlined in Table 4.6.

Upgrade to solar or gas

Solar water heating is the most energy-efficient means of heating water. Supplementary heating is typically required to boost water to the required temperature (e.g. on cloudy days or at night). Gas boosting should be used in preference to electric boosting where it is available. Alternatively, a gas hot water system can also be installed in preference to an existing electric system.

Excellent payback periods were found for hot water opportunities, with less than two years payback for gas systems and less than three years payback for solar.

Insulate pipework

Check your hot-water distribution system. Insulating this pipework can reduce heat losses by up to 70 per cent. Heat loss reductions will also enable you to lower the outlet temperature of hot-water systems. Running hot-water systems at higher than necessary temperatures will increase your energy requirements. A minimum temperature of 60 °C must be maintained to prevent legionella in a hot-water storage system.

Place timers on instant hot water units

An additional savings measure can be to install timers on instant hot water units. This initiative has a negligible cost, but can save up to two per cent of total hot water use.

Save water, save energy

Minimising the amount of hot water used also reduces the energy required to heat the water. Ensure your energy efficiency plan takes this into consideration and you may also benefit by saving on your water bill as well.

Table 4.6: Hot water energy and cost savings

Measure	Cost	Annual savings	Payback period
Timers on instant boil units	< $1,000	Typically up to 2% of total hot water energy use	< 1 year
Solar hot water	$5,000–$30,000	Typically up to 5% of total hot water energy use	2–3 years
Instant gas hot water	$10,000	Fuel switching	1–2 years

4.6 Building fabric

Outside temperature plays a key role in determining the energy use of your club. The building fabric is important in determining the amount of energy required to heat or cool a building. For example, buildings with poor insulation can use up to 25 per cent more energy for heating and cooling.

Insulation

Installing ceiling insulation is likely to have the biggest impact on reducing variations between inside and outside air temperatures. Insulation can reduce heating and cooling energy requirements by up to 25 per cent. In colder climates, insulating walls and floors, where accessible, will also reduce heat loss.

Window tinting and shading

External shading devices, such as canvas awnings and roller shutters, reduce heat gain through windows in summer by 70 to 85 per cent. Fitting tinted or reflective coatings to windows can reduce the amount of solar heat gain where external shading devices aren't suitable. If you plan to apply reflective film to windows, select the solar heat gain coefficient (SHGC) carefully as the film will also reduce heat gain in winter.

Utilising club refurbishments

Club refurbishments are an excellent time to consider upgrades to the building fabric. Often, energy efficient design features can be included in your refurbishment for little or no additional cost, reducing the need for retrofitting after the event.

During refurbishments, consider the strategies in this section to improve the performance of your club's building fabric, making sure you take into account the full cost of your decisions, not just the upfront costs.

Inefficient designs can add significant costs to the heating and cooling requirements for your club over a number of years.

4.7 Other opportunities

In addition to the main technology areas discussed in the sections above, there are a number of other energy savings opportunities that you can consider in your club. Table 4.7 lists some of these.

Timers for IT and other equipment

The use of timers on IT equipment such as printers and photocopiers is a cheap and easy way to save energy. You should also consider whether other equipment such as vending machines or coffee machines can also be fitted with timers.

Swimming pool covers

Installing a swimming pool cover can save up to five per cent of site gas use. There are additional electricity savings as the ventilation system servicing the pool can be turned down or off when the pool cover is on.

Capital costs are relatively low, between $5000 and $20,000, with payback periods of two to three years.

Solar PV

The installation of solar photovoltaic (PV) systems is an excellent opportunity to reduce energy costs in clubs. Commonly known as solar panels, solar PV systems directly generate electricity from the sun, which can then be used on-site or returned to the electricity grid. It is more cost effective to use the electricity generated on-site, so a solar PV system should be sized accordingly.

The efficiency (and therefore the cost effectiveness) of solar PV depends on many factors from the quality of the equipment to the orientation of the buildings where they are installed. For example one Energy Saver audit recommended the installation of a 100 kW system, with a capital cost of $200,000 and an 8.3 year simple payback. It was estimated that this system would generate 140 MWh / year.

Costs for solar PV systems have come down significantly in recent years and they can be an effective way for clubs to reduce their energy bills.

Cogeneration/trigeneration

Cogeneration refers to the on-site generation of electricity though an on-site generator (usually a reciprocating gas engine), where the waste heat is captured and utilised. Trigeneration goes one step further by generating cooling from this waste heat, usually through an absorption chiller. Recent increases to electricity prices have made some smaller cogeneration and trigeneration systems cost effective, with many sectors of the economy now utilising this technology.

For maximum efficiency, cogeneration systems require maximum utilisation of the waste heat, which may be difficult in some clubs. Due to the capital-intensive nature of this technology, it may not be the most efficient way to increase efficiency and reduce cost.

OEH suggests that a specific feasibility study be conducted by a club that is considering installing a cogeneration system. Clubs with significant year-round heating requirements (e.g. a swimming pool) will generally have higher cost savings and a lower payback period from utilising this technology. However, it's worth noting that energy efficiency actions are usually a more cost-effective approach than installing a cogeneration system.

The *Energy Saver Cogeneration feasibility guide* is designed to help you understand cogeneration and the steps you need to take to determine whether a system is feasible at your site. The cogeneration feasibility tool can be used to help you make an informed decision about the financial viability of cogeneration for your site. Download a copy of the guide and tool at **www.environment.nsw.gov.au/sustainbus/energysaver/cogeneration.htm**

Is cogeneration suitable for your site?

Energy Saver has developed introductory and technical cogeneration training courses to help participants understand and apply cogeneration feasibility. For more information and to register for Cogeneration feasibility training, visit **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm**

Voltage optimisation

Voltage Optimisation Units (VOUs) are devices that reduce the incoming mains voltage to match the rated voltage of the connected equipment, with the primary aim of saving energy and reducing maximum demand. VOUs have been successfully installed in some clubs within NSW with some sites recording savings of over 10 per cent. The average savings across all audited sites is around eight per cent.

VOUs reduce the incoming supply voltage to match the rated voltage of equipment and in doing so reduce the power consumption. The standard mains supply voltage in NSW used to be 240 V but has now been reduced to 230 V. Most existing electrical equipment is rated 220 V/240 V or 230 V/240 V providing scope to reduce the voltage.

Reducing the supply voltage can reduce the power consumption of some equipment, which is the main purpose of a VOU. How much power reduction depends on the types of equipment in the installation. For example, installations with old fluorescent lighting could reduce power consumption but those with modern luminaires having electronic ballasts may not reduce power significantly. Electric motors of a few kilowatts and less rated at 230 V and 220 V may also draw less power when the voltage is reduced from 240 V and above down to the rated voltage. However, electric motors with variable speed drives would not draw significantly less power.

Some VOUs also provide other benefits, including balancing phase voltages, suppression of harmonics and transient voltage protection. VOUs with automatic regulators can maintain the voltage within a few volts and also increase voltage if the supply voltage is too low.

Table 4.7: Other energy and cost savings

Measure	Cost	Annual savings	Payback period
Pool blankets	\$5,000–\$20,000	Typically up to 5% of total site gas use	2–3 years
Gaming machines time of use	\$0–\$10,000	Amount of savings depends on how long machines are turned off for. Clubs can generally save 10%–20% of total gaming machine energy use	< 1 year
Timers on IT equipment	\$0–\$1,000	Typically less than 1% of total site energy use	< 1 year

5. What can you do in your job?

5.1 Chief executive officers

Rising energy prices have made a company-wide focus on energy efficiency a key priority. Costs associated with energy use are controllable and effective policy and plans can reduce their impact and deliver a range of other benefits for your club. It is important to have the right members of your team working on the right aspects of this issue and for you to receive appropriate reporting on a timely basis.

What can you do?

- Appoint an energy manager and encourage the development of an energy team.
- Approve a club-wide energy policy.
- Ensure you receive energy reporting information on a timely basis and discuss key issues at board level.
- Get your team to develop appropriate key performance indicators and measure performance against these targets.
- Encourage your team to develop a long term energy plan for your endorsement.
- Link energy management with other key business priorities.

5.2 Chief financial officers

Investments in energy efficiency can provide excellent return on investment and help control rising costs. Initially, awareness of likely price increases and use patterns is important to understand the long term cost impacts of energy use. With this knowledge, financial targets and plans can be created to deliver long term benefits for your club. Understanding the true financial impact of decisions relating to energy efficiency will help ensure success.

What can you do?

- Forecast future energy use and costs – utilise the Institute of Sustainable Futures report (Section 2.3).
- Develop payback period targets.
- Analyse projects using internal rates of return (IRR) or net present value (NPV) to ensure all viable projects go ahead.
- Ensure your team is accessing all available sources of external funding for energy efficiency – consider Energy Savings Certificates for all energy saving initiatives (Section 3.4).
- Develop a capital expenditure plan, which includes the replacement of major equipment at the end its economic life.
- Use full lifecycle costing to determine the optimal equipment choice.
- Consider energy efficiency impacts for your club during renovations and refurbishments.

5.3 Facilities managers

The modern club is never static. Ongoing renovations and refurbishments are the norm, and even when these are not occurring there are always a multitude of day to day issues to deal with. As the facilities manager you are in a unique position within your club to make sure that energy efficiency can be rolled out effectively, while maintaining and improving the performance of your club and the experience of your patrons.

What can you do?

- Lead or be actively involved in the club's energy efficiency team.
- Understand the structure of your energy bills by monitoring energy spikes or sustained increases and act accordingly.
- Ensure maintenance procedures include energy efficiency considerations such as verification of economy cycle performance.
- Routinely implement no and low cost energy efficiency improvements.
- Utilise club renovations and refurbishments to improve energy efficiency.
- Use your detailed knowledge of club operations to assist other staff build the business case for change.

5.4 Operations managers

A lot of work is required on a day to day basis to ensure the smooth running of your club and sometimes energy efficiency may not seem like a priority. However, incorporating energy efficiency considerations into the day-to-day running of the club can help things run more smoothly as well as helping to deliver your corporate goals and budgets. Make sure a lack of knowledge in your team does not become a barrier to delivering energy efficiency. If you need help or training, be sure to ask for it.

What can you do?

- Focus on energy efficiency as part of day to day operations of your club.
- Ensure you and your staff have adequate energy efficiency training – if not, ask for it.
- Monitor and improve performance on a daily basis.
- Use energy efficiency and sustainability to better engage with your members.
- Celebrate the wins with your teams!

5.5 Operations staff

Clubs are all about the experiences of their patrons. Frontline and support staff deliver this experience and make sure that your club runs efficiently on a day to day basis. Include energy efficiency considerations in your day to day job. If you see an area that can be improved make sure you pass on your ideas and help deliver the improvement in club performance.

What can you do?

- Have an eye for energy efficiency – look out for areas in the clubs that can be improved.
- Suggest energy efficiency improvement ideas to your manager.
- Make sure you request training for any area of energy efficiency you need.
- Involve your patrons. Energy efficiency and sustainability can help further develop your club's relations with your local community.

6. Energy efficiency checklist

Use this checklist to walk around your site and identify opportunities for energy savings. Refer to **Section 4** of the toolkit for further background information on each area.

Heading, ventilation and air conditioning	Action required
Section 4.1 – Page 11	
Check temperature setpoints (optimum settings are 20 °C for heating in winter and 24 °C for cooling in summer).	
Can a dead band be set around the temperature setpoint?	
Do staff know how to control the air conditioning? Do they over-ride the controls? Why?	
Are temperature sensors located in areas that will represent the room's temperature? (not blocked by furniture or next to entry ways)?	
Are any empty areas being air conditioned?	
Where can timers or occupancy sensors be linked to the air conditioning?	
Ensure that 100 per cent outside air is not being used when not required.	
For centralised air conditioning systems, are outdoor air economy cycles, variable-speed drives or timers and controllers used?	
If a centralised air conditioning system is being used, is the supply and return ductwork and pipework insulated?	

Heading, ventilation and air conditioning	Action required
Section 4.1 – Page 11	
Are any air conditioning units past their end of life? (refer to **Section 4.1**). If so, investigations should be made into upgrading these.	
Is a maintenance schedule followed for cleaning and replacing filters, and inspecting ducts and pipework for signs of damage or wear and tear?	
Ensure system operating hours match the times when heating or cooling is required as needs vary throughout the day. Fit time switches to automate this process.	
Can carbon monoxide detectors be installed for carpark ventilation systems?	
If you have a gas central heating system, are gas boilers serviced regularly? Is a combustion analysis undertaken during this service? Ask for this to be included. Running efficiencies should be at least 80 per cent.	

Lighting	Action required
Section 4.2 – Page 14	
Are windows, light fixtures and skylights clean?	
Are there areas where skylights could be installed to reduce the need for artificial light?	
Buy a lux meter and find out what your lux levels are. Check these against the standards.	
Are there any opportunities to delamp in overlit areas?	
Do staff know where light switches are, or how they are controlled? Are switches labelled?	
Are any empty areas lit unnecessarily?	
Where can timers, occupancy sensors or daylight sensors be linked to lighting?	
Do you have old T8 fluorescent lighting? These can be replaced with T5s.	
Do you have 50 W halogen lamps? These can be replaced with Light-Emitting Diodes (LEDs).	
Do you have large banks of fluorescent lights (e.g. in a car park) where a voltage reduction unit could be installed?	

Gaming machines	Action required
Section 4.3 – Page 17	
Are your gaming machines switched off when not in use?	

Catering	Action required
Section 4.4 – Page 18	
Is your exhaust fan running when the kitchen is empty? Investigate the potential of putting this on a timer, heat sensor or installing a Variable Speed Drive (VSD) on the fan motor.	
Check refrigerator and cool room door seals.	
Are condensers and evaporator coils clean and free of dust? Do any condensers need replacing?	
Check that temperature sensors in cool rooms are in a suitable location and that they work (either by dropping them in an ice bath or with another thermometer).	
Ask your maintenance contractor to check that refrigerant levels are correct.	
Do you know when your defrost cycles occur? Can these be reduced or moved to off-peak times? (check with the manufacturer's recommendations)	
Does your cool room have Electronically Commutated (EC) fans? If not, consider retrofitting these.	
Do you have a startup and shutdown schedule for kitchen equipment?	
Do you need to purchase new kitchen equipment? Take the operating energy costs into account when weighing up the costs of different equipment. Gas appliances will be cheaper to run.	

Hot water	Action required
Section 4.5 – Page 19	
Do you have water-efficient devices in bathrooms and kitchens? Reducing your use of hot water will also reduce your energy use.	
If your pipework is insulated, at what temperature are you running your hot-water storage? A minimum of 60 °C is required. Reduce the temperature to meet this and check outlet temperatures at the end of pipe runs.	
If you have a separate hot-water system servicing your laundry or kitchen, install a timer on its recirculating pump to turn it off overnight.	
Is it time to upgrade your electric hot-water system? If so, investigate options for a solar or gas hot-water system.	

Building fabric	Action required
Section 4.6 – Page 20	
Check ceiling space for insulation. Is there 100 per cent coverage, could it be improved?	
Are there any opportunities to add external shading or tinting to windows that receive a lot of summer sun?	
Are windows fitted with curtains and pelmets to reduce heat loss during winter?	

Other opportunites	Action required
Section 4.7 – Page 20	
Is equipment left on out of working hours or when not required?	
Install timers on equipment where you can (e.g. printers, zip boilers, vending machines)	
Upgrade to a multi-function device instead of using separate printers, photocopiers and fax machines.	
When buying new appliances check the energy star rating label.	
Does you use a pool blanket on your swimming pool?	
Do you have a building management sytem? If not, consider purchasing one. If so, can it be optimised?	
Check your power factor and install power factor correction equipment if appropriate.	
Do you have space on the roof suitable for solar panels?	
Do you have a significant enough need for heating (such as an indoor pool) to consider a cogeneration system?	

7. How to get started

Step 1: Work out your energy baseline

- Use your bills and electricity interval data to work out your energy baseline. Include information from your BMS and submeters if available.
- Develop a system for recording this information. A spreadsheet can be an effective place to start.
- Look for trends and abnormalities in the data. Is your use increasing or decreasing? Are you using more or less off-peak energy? Is your percentage of gas use going up or down? Are there any strange spikes or drop offs?
- Use this information in step 4 below when you are determining priorities.

Step 2: Appoint an energy champion and establish your energy team

- Work out who should be in the energy team. Which departments should be represented? Also make sure you have at least one representative from senior management.
- Make sure the team meets regularly and record your meetings. Set up a schedule for upcoming meetings.
- Make sure the team has a clear purpose, which is endorsed by senior management. This is an excellent opportunity to develop a formal energy policy.

Step 3: Set energy targets and key performance indicators

- Make sure you understand your current use patterns first. What is the likely impact of business as usual energy use?
- Set an overall target for energy use. Make sure it includes both energy consumption and energy costs, so you can track decreased use even if power bills rise. Consider the use of short and long term targets.
- Develop key performance indicators (KPIs) that are relevant to your club's performance. Include energy use per square metre as a key KPI (see **Section 3**), which will allow you to benchmark your performance against other clubs. Measuring by square metres also allows you to track your performance over time if you club's floor area changes due to renovations.

Step 4: Determine initial priorities

- Start by going through the energy efficiency checklist in **Section 6**. List initial priorities and areas for investigation.
- Develop a centralised register for energy efficiency ideas, to keep all opportunities and priorities in the one place.
- What are the low and no cost opportunities for your club? Many of these opportunities are either free or can be included in regular maintenance and operations budgets and will require minimal approval.
- Work out what staff training is required. Determine the best way to deliver this.
- Involve your contractors. Make sure energy efficiency is a key consideration for all maintenance contracts.
- Consider whether additional technical support is required, including whole of site or technology specific energy audits.

Step 5: Plan your capital expenditure

- Is there an existing capital expenditure budget for major equipment upgrades? Use this as a starting point for developing your capital expenditure plan.
- Determine what equipment needs replacing. When will it reach the end of its economic life?
- Include any known opportunities to upgrade to energy efficient equipment in your CAPEX plan.
- Make sure you use full life-cycle costing when purchasing new equipment. The purchase price of equipment is usually small when compared with long term operating costs, often making the energy efficient option the most financially attractive option as well.

Step 6: Monitoring and measuring

- Report energy use internally. Make sure this information reaches the senior management team and/or the board.
- Look at the performance of individual pieces of equipment that consume large amounts of energy. Consider data logging or submetering this equipment if your current BMS can't do this. This tracking will assist with developing an optimal maintenance schedule and determining when major equipment should be replaced.
- Track your performance. How is the club performing compared with your targets and KPIs? Start measuring your performance against other clubs.

8. Further support

After you have identified where energy savings can be made (the checklists should assist you), there are several sources of help.

Energy Saver provides a range of reports, training courses and case studies to assist organisations in their energy management.

Publications

Reports on lighting, industrial refrigeration and cogeneration are free to download from the Energy Saver website. Visit **www.environment.nsw.gov.au/sustainbus/energysaver** to download them and check for new publications.

Case studies

A range of Energy Saver audit case studies are available at **www.environment.nsw.gov.au/sustainbus/escasestudies.htm**

Energy efficiency training courses

Energy efficiency training for the Clubs sector

Energy Saver has developed a training course that addresses the specific energy efficiency needs of the clubs sector. The training will enable you to identify appropriate energy efficiency upgrades, assess their feasibility and develop an action plan for your club.

The training is intended for senior managers, facilities and operations managers, financial managers and sustainability staff in the clubs sector.

For more information and to register your interest for future courses, visit **www.environment.nsw.gov.au/sustainbus/esclubs.htm**

Additional courses

Energy Saver delivers a range of training courses to assist business in understanding energy management and efficient technologies. Current courses include:

- Energy management basics
- Energy efficient HVAC for business
- Energy efficient lighting
- Energy efficiency in commercial refrigeration
- Cogeneration feasibility.

In-house customised training of any course, for groups of 15 or more is available on request.

We are always developing new courses. Visit **www.environment.nsw.gov.au/sustainbus/energysaver/training.htm** to find the next course suitable for you.

Contact the Energy Saver team:

Email: energysaver@environment.nsw.gov.au
Phone: 1300 361 967
Web: **www.environment.nsw.gov.au/sustainbus/energysaver**

9. Glossary

Ballast: an electrical device that regulates the power delivered to fluorescent and high intensity discharge lamps. Conventional ballasts are known as wound ballasts, magnetic ballasts or copper ballasts. Electronic ballasts are an upgrade in technology from conventional ballasts and use less energy.

Baseload consumption: energy used during a non-operational period for a business, for example overnight at a club when there are no patrons present

Building management system (BMS): A computer-based control system designed to control, monitor and optimise various building services.

Depending on the installed hardware and software the BMS has the ability to check inputs such as temperature, humidity, air distribution, carbon dioxide levels and energy consumption.

The BMS can then control the operation of services such as heating, ventilation, cooling and lighting through on/off controls triggered by the input variables.

Damper: A moveable plate that regulates the flow of air inside an air conditioning duct.

Delamping: The removal of light fittings in an overlit area, to reduce energy consumption

Gigajoule (GJ): A unit of energy, used to indicate a volume of gas, with 1 MWh = 3.6 GJ. The volume of gas equivalent to a gigajoule varies with the gas composition, but is about 26 m3. Gas bills usually display megajoules (MJ); 1000 MJ = 1 GJ.

HVAC system: Heating, ventilation and air conditioning system.

Lux: the amount of light that falls on a given area. This is measured in lumens per square metre and is known as lux.

Megawatt hour (MWh): A unit of energy, especially electrical energy, equal to the work done by one thousand kilowatts acting for one hour and equivalent to 3.6 gigajoules. Electricity bills usually display kilowatt hours (kWh); 1000 kWh = 1 MWh.

Submetering: Submetering is the installation of metering devices to measure actual energy consumption downstream of the primary utility energy meter. Submetering allows you to monitor energy use for individual buildings, pieces of equipment or other loads to account for their actual energy use. Submetering can also interface with software programs to create energy use charts and graphs.

T5 lamp: Linear fluorescent lamp with a diameter of 5/8ths of an inch.

T8 lamp: Linear fluorescent lamp with a diameter of 8/8ths of an inch.

Variable speed drive (VSD): A motor plus controller in which the controller varies the frequency of the power supplied to the motor, thus changing its speed. Often used in air conditioning units to better match the capacity and the load. Often called "Inverter technology".

Voltage optimisation units (VOUs): devices that reduce the incoming mains voltage to match the rated voltage of the connected equipment.

Voltage reduction unit: This unit can control the voltage supplied to appliances. When installed at the switchboard on fluorescent lighting circuits it supplies mains voltage to the lights when they start up, then reduces this voltage after the lights have warmed up. As the power required to turn this type of light on is more than the power needed to maintain the lighting level, energy savings are made by this drop in power.

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