

Sports and leisure

Introducing energy saving opportunities for business



Making business sense
of climate change

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Reducing energy use makes perfect business sense; it saves money, enhances corporate reputation and helps everyone in the fight against climate change.

The Carbon Trust provides simple, effective advice to help businesses take action to reduce carbon emissions, and the simplest way to do this is to use energy more efficiently.

This overview introduces the main energy saving opportunities for businesses in the sports and leisure sector and demonstrates how simple actions save energy, cut costs and increase profit margins.

Introduction

This overview is designed to help leisure centres save money and energy as well as reduce their environmental impact through better energy management.



Picture courtesy of Andrew Southall/Feilden Clegg Bradley Architects

In a typical sports centre, energy costs are second only to labour costs, accounting for as much as 30% of total running costs – a higher figure than in most other sectors.

Anyone involved in the running of sports and leisure centres will find the advice in this publication useful, particularly general managers and energy managers. Focusing on low and no-cost measures which are likely to have the quickest payback, this overview demonstrates the best energy saving opportunities for the sector and will help with:

- ▶ Assessing the potential for energy savings and indicating key areas for improvement
- ▶ Raising awareness of energy conservation amongst staff and motivating them to reduce waste
- ▶ Appraising the overall performance of a sports and leisure centre.

Just by making a 10% improvement in the management of energy use, UK leisure facilities could save up to £70M each year and reduce carbon emissions by hundreds of thousands of tonnes.

Energy consumption in the sports and leisure sector

To identify areas with the greatest savings potential, managers need to know where energy is being used and which processes consume the most energy. There are a number of common areas within the sports and leisure sector where energy is commonly wasted:

- ▶ Heating
- ▶ Ventilation and air conditioning
- ▶ Lighting
- ▶ Swimming pools
- ▶ Electrical equipment, such as gym apparatus and vending machines

Swimming pools are the major energy consumer in this sector – specifically the processes for heating the pool water and ventilating the pool hall. For 'dry' centres (centres with no pool), space heating will be the largest energy user.

In each of the key consumption areas identified in this publication there are three main opportunities to save energy:

Switching off – All energy consuming equipment should be switched off when not required

Maintenance – A number of energy efficiency measures can be carried out as part of routine maintenance for little or no extra cost

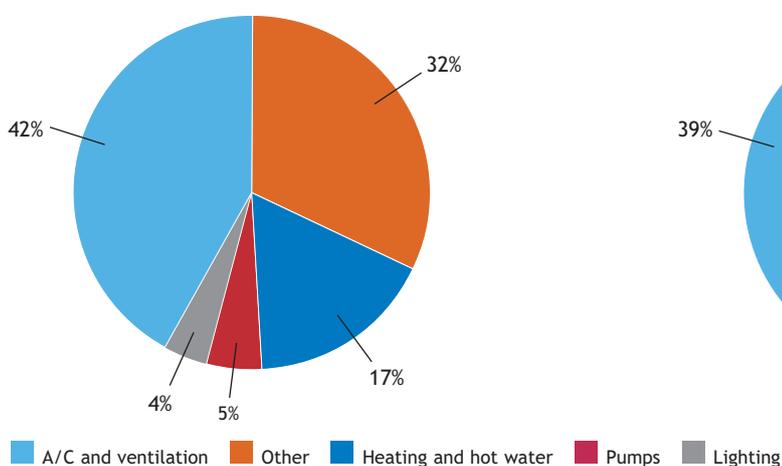
Refurbishment – Energy saving measures taken when planning major building refurbishment can be extremely cost-effective.

How is energy used in leisure centres?

In most leisure centres, energy is supplied in two forms – fossil fuel (gas, oil, coal or LPG) and electricity. For the majority of sites, space heating and hot water is supplied by fossil fuel; however some centres only have access to electricity or use it more extensively, such as for space heating and ventilation. Electricity is also used for lighting, electrical equipment, fans and pumps.

Energy use versus cost for a centre with a pool

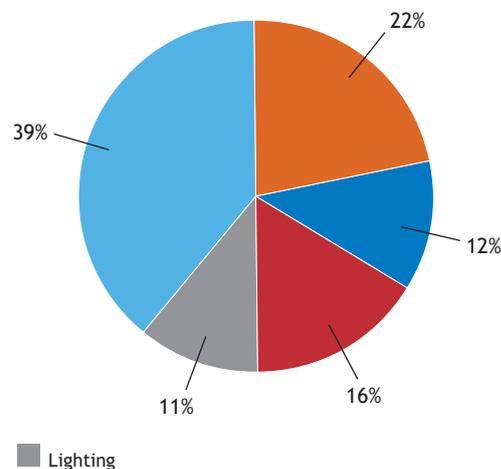
Figure 1 Energy use for a typical leisure centre with a pool



Electricity is an important element to control and, as much electricity usage is within the control of end users, it should take first priority in reducing costs.

Figures 1 and 2 below show the energy use and energy cost breakdown for a typical leisure centre with a pool. The higher costs of electricity use can clearly be seen when comparing the charts. For instance lighting costs (in the second chart) make up 11% of the total costs compared with only 4% of overall energy use as shown in the first chart.

Figure 2 Energy costs for a typical leisure centre with a pool



Opportunities for energy saving

▶ Heating

Heating accounts for a large proportion of energy use in leisure centres which means that there are big opportunities to make savings.

All centre managers recognise the importance of keeping customers and staff comfortable, but many do not realise that it is possible to minimise the cost of heating, regardless of which system is in place. Some centres have shaved up to a third off their heating costs through the implementation of some simple energy saving measures.

Further information about all of the actions given here is available in the Carbon Trust's *guide to Heating, ventilation and air conditioning* (CTV003).

Maintain appropriate internal temperatures

It is important to set the temperatures in public spaces according to the type of activity taking place. A good starting point is to know the recommended temperatures for particular building areas or activities and use that as a guide (see Figure 3). Always provide practical staff uniforms so suitable comfortable temperatures can be maintained. Listen to staff, especially after making changes to temperature control and act on any feedback.

Ensure controls match building occupancy

Check that heating system operating hours match the times when heating, ventilation and cooling are required, as needs vary throughout the day. Use simple time switches in smaller centres (of less than 1000m²) to help to automate this process so that nobody forgets – and ensure time settings are reviewed every month or so to check that they are correct. Many systems function inefficiently because someone made a short-term adjustment and then forgot about it. Larger centres should refer to page 6 of this overview for some more ideas on controlling their heating.

Late-night or early-morning sports sessions may mean heating parts of the building at unusual times, but only heat areas that are necessary for requirements.

▶ **MYTH** – Heating has to be on all the time to keep customers happy.

FALSE – It is often possible to shut down heating an hour before a centre closes without any noticeable difference to staff or customers.

Figure 3 Recommended heating temperatures for sports and leisure facilities

Space type	Temp (°C)
Multi-purpose	12-18 for sports activities and 18-21 for sedentary activities
Pool hall	Air temperature 1°C above water temperature (pool temperatures are given on page 12)
Fitness centre	16-18
Weight training	12-14
Squash courts	16-18 for courts and 18 for spectators
Ancillary halls	15 for sports and 21 for non-sports
Changing areas	20-25
Reception, offices and circulation	16-20
Crêche	21
Refreshment and bar areas	18

Open door policy?

Customers require easy access to a centre but open doors allow warmed air to escape and cold air to enter in winter. The thermostat then senses a temperature decrease and automatically switches on heating which may be unnecessary. In warmer months, centres with air conditioning may find their cooled air escaping too. Ideally, automatic or revolving doors should be installed to retain the inside temperature while ensuring that customers have easy access. Alternatively, a draught lobby could be considered to reduce the amount of hot or cool air lost through open doors.

Reducing heating temperatures by just 1°C can cut fuel consumption by 8%.

Optimum system control

Controlling temperature is difficult in many types of building. Some signs of poor control include:

- ▶ Heating being on when the building is unoccupied, because timers are not set correctly
- ▶ Heating being on too high or not high enough, because the thermostat is located where sunlight, radiators or office equipment affect the reading.

Often, simple adjustments to the location and setting of controls can reduce costs without affecting staff and customer comfort.

▶ MYTH – Boilers have to be on all year round.

FALSE! – If you have several boilers, it is likely there is a smaller one designed to supply your domestic hot water needs only. In a dry leisure centre, switching off the other boilers, particularly during summer months, can save 5% of water heating costs.

Maintain boilers and pipework

Have boilers serviced regularly by a reputable firm. Gas-fired boilers, which are most common in leisure centres, should be serviced once a year; oil boilers twice a year. A regularly serviced boiler can save as much as 10% on annual heating costs.

Boilers, hot water tanks, pipes and valves should be insulated to prevent heat escaping. Payback can usually be expected within a few months of installation, with additional savings in subsequent years.

As well as providing heat for the centre, boilers also provide hot water which is used in changing rooms and catering facilities, so it is particularly important to keep them in good condition and as efficient as possible.

The Carbon Trust has further advice on energy saving with boilers, including a technology overview of *Low temperature hot water boilers* (CTV008).

top tips:

- Turn off heating in saunas and steam rooms when not in use, as the electric heating in these facilities is expensive to run
- Use a cover to minimise heating costs in spa pools and jacuzzis. Remember to switch off the spa pool when not in use and consider installing a timer to automate this process for you.

Consider weather compensation and optimum start controls

Some heating systems automatically adjust themselves in line with the changeable UK climate. A **compensator** is a form of control for heating systems that automatically regulates the heating temperature based on the weather. An **optimum start controller** learns how quickly the building reaches the desired temperature and brings the heating on at the optimum time prior to building occupancy, again depending on the weather.

These types of controls can save thousands of pounds and will pay back their investment in just a couple of years. Consult a qualified heating technician to discuss the range of options available. More information can be found in the Carbon Trust's free publication *Heating control* (CTG002).

Consider Combined Heat and Power (CHP)

A combined heat and power (CHP) unit generates electricity on-site, often using a gas-fired generator. It saves energy and money by making the engine's heat, which would normally be wasted, available as hot water or steam. It therefore substantially reduces a centre's electricity requirement from the mains, but increases gas use marginally because the CHP unit produces hot water with less efficiency than a boiler. The best sites for CHP are usually those where there is a year-round heat demand such as leisure centres with swimming pools. In an appropriate application, CHP can reduce a centre's energy bill by around 20-30%.

fact:

CHP can have financial, environmental and strategic benefits. A well-designed and operated CHP plant can reduce carbon dioxide emissions. However, CHP schemes represent a significant long-term investment and so the economics need to be studied carefully before a decision is made.

CHP systems qualify for Enhanced Capital Allowances and their fuel input is exempt from the climate change levy. Contact the Carbon Trust for more information.

► Ventilation and air conditioning

The use of ventilation and air conditioning in both dry and wet sports centres is commonplace due to heat gains from lighting, staff, customers and electrical equipment.

Fundamentally, the more heat that is generated, the harder the air conditioning system has to work to maintain the desired temperature.

In wet centres, however, ventilation systems are ultimately employed to maintain correct pool hall conditions. They are an integral part of pool hall design and provide an essential service yet unfortunately consume a significant amount of energy. If air is mechanically removed, then the money used to heat and cool it is also lost. The lost air then has to be replaced with the same amount of air from outside which needs to be heated or cooled to match inside temperatures – all costing money.

Always consult a qualified expert – don't switch off systems without checking first!

► **MYTH** – Leaving air conditioning on overnight reduces energy costs as the system stays at the required temperature.

FALSE! – The result is a much higher energy consumption than necessary.

REMEDY – A leisure centre only needs a fraction of overnight energy to reach adequate temperatures for the start of the day. Air conditioning may not be needed at all at this time if 'night cooling' is used.

Take advantage of natural ventilation and free cooling

Using natural ventilation and cooling techniques means that mechanical methods are needed less – if at all.

As simple as it sounds, natural ventilation and cooling relies on natural air flow between openings on opposite sides of a room or building – or rising warm air being replaced with cooler air sucked in through windows or vents. It may be possible to use windows and doors to provide good levels of natural ventilation inside a leisure centre, allowing mechanical ventilation to be switched off or turned down to save money. When opening vents, doors and windows, always consider security implications.

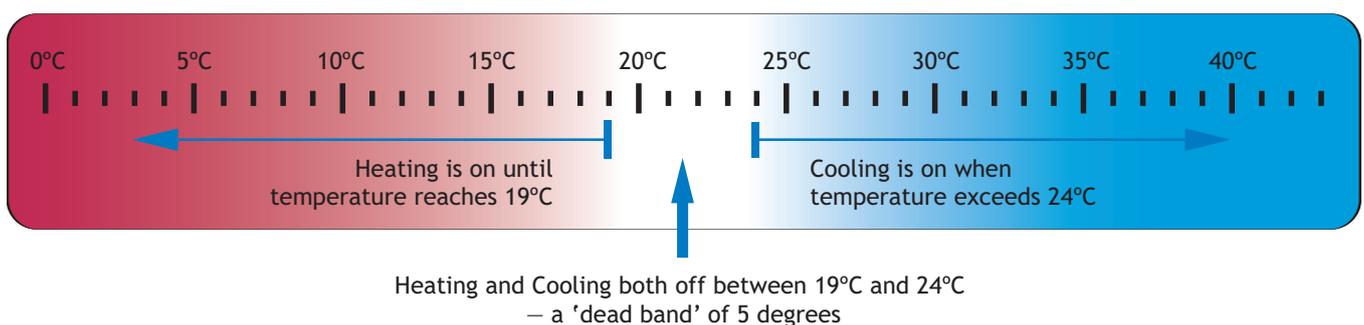
Keep doors and windows shut if air conditioning is on

If warmer outside air is allowed to enter cooled areas, the air conditioning units will be automatically switched on to maintain temperature. Keeping windows and doors closed will help prevent this occurring and ensure only the necessary internal space is cooled.

Don't let heating and cooling operate at the same time

This can be avoided by setting a temperature 'dead band' – a wide gap between the temperatures at which heating and cooling cut in. For example, in reception, the heating might switch off when a temperature of 19°C has been reached and then cooling would not come on until the temperature exceeded 24°C. Refer to the table on page 4 for a list of recommended temperatures for different areas, and adjust the heating and cooling accordingly.

Figure 5 Diagram of 'dead band' control providing recommended temperatures



Maintain system components to ensure efficiency

Energy consumption can increase by up to 60% if regular maintenance is not undertaken. Dirty or faulty fans, air ducts and components directly affect system efficiency and will increase running costs and risk of breakdown. The performance of the whole system should be reviewed annually and replacement parts ordered as necessary.

Don't be afraid to ask – if you are concerned that your system is not operating correctly, or if staff complain about draughts from ventilation fans, talk to your maintenance technician.

Note: The existing layout of your pool hall ventilation system will determine which energy saving measures will be the most practical and effective.

Stay cool at night

In some cases, ventilation fans can be run overnight to cool a large centre, thus delaying the switching on of air conditioning. This is known as 'night cooling'. More information can be found in the Carbon Trust's *Heating, ventilation and air conditioning* technology overview (CTV003).

➤ **MYTH** – Turning air conditioning thermostats down as low as they can go, cools a leisure centre more quickly.

FALSE! – The temperature drops at the same rate but then overshoots, making it uncomfortable for the staff and using more energy than necessary. If controls are not coordinated, the temperature could even go low enough for the heating system to be switched on. Both systems then operate at the same time.

REMEDY – Set thermostats correctly and educate staff to dispel this myth. As a last resort, protect thermostats to prevent tampering, where possible.

Minimise the cooling load

To save money and increase comfort, it is better to reduce the amount of heat produced in an area than to raise ventilation rates or employ mechanical cooling.

Lighting and electrical equipment generate large amounts of heat. Generally, the more energy efficient this is, the less heat it produces, so install low energy lighting and make sure that unused machines are switched off as this will reduce cooling costs. Direct sunshine through large windows can also lead to overheating. Consider replacing window panes with special heat reflective glass and fit awnings to shade main windows.

Consider fitting variable speed drives (VSDs)

Few ventilation fans need to operate at full speed all of the time and VSDs can help to reduce costs by enabling the output speed of the fans to match requirements at different times of the day or for different processes. VSDs can be effectively used throughout ventilation systems and they are particularly applicable to pool halls where energy savings of 20% are possible. A basic overview of this topic can be found in *How to select a variable speed drive* (GIL152) which can be ordered from the Carbon Trust. Other publications on motors are also available.

DID YOU KNOW?

Some sports and leisure centres use what is known as a 'mixed mode' system, which uses a combination of both natural and mechanical systems. The building uses natural ventilation, heating and cooling where possible, with mechanical systems being used only when needed. There are various advantages of such a system:

- The building becomes more adaptable to a wide range of requirements
- The occupants have more control over their environment
- Centres can cut down on energy spend and carbon emissions.

▶ Lighting

Lighting can account for up to 20% of total energy costs in dry leisure centres and around 10% in centres with a swimming pool. There are many simple and inexpensive ways to reduce the energy consumption and costs associated with lighting without compromising staff and customer comfort.

What lighting is really needed?

Different areas require different light levels. Reception and customer areas need to be bright and welcoming, but corridors and storerooms could be at a lower level. If an area will have spectators, there may need to be the option to have more light on the playing area than might be adequate for, say, a fitness suite. Changing rooms require a balance of lights – brighter over mirrors, but less so in toilets and showers. Outside areas such as playing fields and car parks should also be considered as they may need a very different approach from internal lighting (see “Daylight sensors” on page 10 for more ideas).

Working out the appropriate lighting level for all areas of the centre is the first step to efficient lighting.

‘Switch off’ policy – involve staff and increase awareness

Involve staff in making savings by conducting regular meetings and placing ‘switch off’ stickers above light switches and posters around buildings. These are available from the Carbon Trust. All staff have a role to play in saving energy so they are educated about wastage and trained to operate equipment and controls effectively. This applies to casual staff also: if a fitness room is not required at the end of the class, ensure the instructor knows the importance of switching off the light.

Label light switches

Light switches should be clearly labelled so employees can select only those lights they need for the activity taking place. Always ensure exterior lighting is switched off in the daytime and that indoor lights are turned off when there is adequate daylight available. Lights in unoccupied areas should also be switched off, but remember to consider health and safety implications.

Maintenance

Lighting is essential for providing a productive and safe working environment so it is important to keep windows, skylights and light fittings clean. Replace old dim lamps and keep controls in good working order by ensuring timers are set to match working hours and that daylight and occupancy sensors are clean. Without regular maintenance, light levels can fall by up to 30% in 2-3 years. Establishing a basic lighting maintenance programme can reduce costs by up to 15% as well as improving light output and appearance.

Install low-energy lighting

Lighting must be selected to provide the required brightness and colour levels for given tasks or activities and also to make the space attractive to the customers. Consider replacing any ‘conventional’ tungsten bulbs that are switched on for more than a few minutes at a time with compact fluorescent light bulbs (CFLs). CFLs will last up to eight times longer than their tungsten counterparts which means less time spent replacing them. They have a similar light output to tungsten bulbs and use only 20-25% of the energy.

Replace blackened, flickering, dim or failed fluorescent tubes with tri-phosphor coated ones. Tri-phosphor coating provides a more natural, brighter light for the whole life of the tube. If the tubes are 38mm (1.5 inch), they should be replaced with slimmer 26mm (1 inch) tubes.

If you are replacing or upgrading your lighting, you may qualify for an interest-free loan from the Carbon Trust. See page 17.

Occupancy sensors

Install occupancy sensors in areas that are only used intermittently such as office areas, storerooms and staff toilets. These help to ensure lights only operate when there is somebody there to require them. Sensors can achieve savings of up to 30% on lighting costs.

➤ **MYTH** – It is better to leave fluorescent lighting on as starting it up wastes more energy than if it remains permanently switched on.

FALSE! – Fluorescent tubes use only a few seconds worth of power in start up – therefore, it is always better to switch them off when you don't need them, even just for a few minutes.

Daylight sensors

Light sensors or 'photocells' can be used to control artificial lighting when there is sufficient natural daylight. As daylight hours vary throughout the year, sensors help to provide closer control and thus, substantial savings. They can be particularly useful for external lighting, such as in car parks, and can often pay back their costs in less than a year. Both occupancy and daylight control are sometimes combined with time switches to provide even bigger savings.

For example, external lighting may be controlled by daylight sensors to switch on when darkness falls, but then a timer could be used to switch these off at 11pm when all customers and staff have gone home. For security purposes occupancy sensors could be used after this time to switch the lights back on if an intruder is detected.

Refurbishment

When replacing older lighting systems, specify modern high-frequency fittings. These reduce energy use and heat output, eliminate flicker and hum, extend lamp life and can allow dimming – all of which can make a building more comfortable for staff and customers. Always consult a qualified lighting technician before upgrading lighting systems.

For large sports halls and pool areas with high ceilings (above 6m), high pressure sodium lamps (SON) should be considered. These are energy efficient and have a long life (6,000-24,000 hours) but have only moderate colour rendering properties. The choice of lamp is important for avoiding glare from the light fitting.

Floodlighting outdoor sports facilities

There are two choices of energy efficient light sources for outdoor sports facilities – metal halide and high pressure sodium lamps (SON). Metal halide is the primary choice because it produces an excellent crisp white light that has good colour rendering which is generally more pleasing for spectators and a good choice if there is to be any television coverage of games. The lamps are efficient, but have a shorter life of 6,000 hours, so lamp replacement costs are generally higher than for SON lamps. SON de luxe lamps, with their golden white light, are suitable where accurate colour rendering is less important. Their main benefit over metal halide lamps is their longer life.

Lighting swimming pools

As well as choosing energy efficient light sources, there are a number of important design issues to consider when lighting a swimming pool. These include:

- ▶ Minimising reflected glare from the light fittings off the pool surface
- ▶ Selecting a light fitting that resists corrosion
- ▶ The colour performance of the lamp.

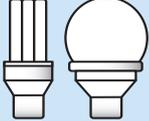
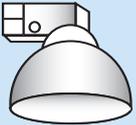
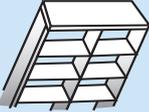
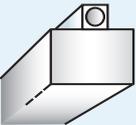
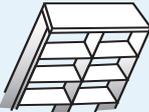
The Carbon Trust has more in-depth information about lighting for pools which addresses these issues. Contact the Carbon Trust for advice and publications.

top tip: swimming pools

Most swimming pools have good daylighting from windows or rooflights. In many cases there will be sufficient daylight to allow some of the lights to be switched off during the day. Make someone responsible for this and, if necessary, change the switching arrangement so that selected lights can be switched off separately. As an example of the savings, if ten 400W SON lamps are switched off for an average of only six hours a day for a year, it will yield an energy saving of £604 per annum (assuming electricity costs of 7p/kWh).

How to spot different types of lighting

Make sure that you have the most efficient type of lighting installed. The following table will help you identify different types of bulbs and whether there might be a more efficient alternative.

Existing lamp type	Energy efficient option	Energy saving/benefits	Application notes
 <p>Tungsten light bulbs</p>	 <p>Replace with compact fluorescent lamps (CFLs) in the same fitting</p>	75% saving plus longer lamp life	General lighting – modern CFL replacements may also be acceptable for display lighting
 <p>38mm (T12) fluorescent tubes in switch-start fittings</p>	 <p>Replace with equivalent 26mm (T8) triphosphor fluorescent tubes of lower wattage</p>	8% saving plus longer lamp life	General lighting, but even better use with modern fittings (see below)
 <p>High-wattage filament lamps or tungsten halogen lamps as used in floodlights</p>	 <p>Replace with metal halide or high wattage compact fluorescent lighting</p>	65-75% saving plus longer lamp life	Flood lighting and some general lighting situations
 <p>Mains voltage reflector lamps, filament spot and flood types</p>	 <p>Replace with low-voltage tungsten halogen lighting or metal halide discharge lighting</p>	30-80% saving for equivalent lighting performance	Spot lighting in considered areas, such as reception or displays. If low voltage tungsten halogen spotlights are installed use 35W infrared coated (IRC) bulbs instead of the standard 50W bulbs
 <p>Fluorescent fittings with the old 2ft 40W, and 8ft 125W fluorescent lamps</p>	 <p>Replace with efficient fittings using reflectors/louvres or efficient prismatic controllers with high-frequency electronic or low loss control gear</p>	30-45% saving with much improved lighting quality. The use of high frequency electronic control gear eliminates flicker, hum and stroboscopic effect	General lighting
 <p>Fluorescent fittings with opal diffusers or prismatic controllers which are permanently discoloured</p>	 <p>Replace with new prismatic controllers or replace complete fittings as above</p>	No reduction in energy consumption but increases the amount of light by between 30% and 60%	General lighting

▶▶▶ Tax incentives

Enhanced Capital Allowances (ECAs) enable businesses to buy energy efficient equipment using a 100% rate of tax allowance in the year of purchase. Businesses can claim this allowance on the investment value of energy efficient equipment, if it is on the Energy Technology List. The procedure for claiming an ECA is the same as for any capital allowance. For further information please visit www.eca.gov.uk or call the Carbon Trust on 0800 085 2005.

▶ Swimming pools

Sports and leisure centres with swimming pools are often major users of energy. Up to 65% of the energy consumed in these centres will be used for pool heating and ventilation. Looking at the way energy is managed can provide substantial savings.

Energy is used in the pool area in a number of ways. Each one should be considered when looking to reduce energy consumption, including:

- ▶ **Loss of pool water heat through evaporation**
- ▶ **High pool hall air temperatures required** – typically 28-30°C to maintain the comfort of pool users and reduce the risk of condensation from humid air
- ▶ **High extraction/ventilation levels required** – usually, 4-10 air changes an hour are needed to remove excess humidity from pool evaporation. High ventilation rates require high levels of fresh make-up air to replace extracted air. All incoming fresh air has to be heated
- ▶ **Continual pumping of pool water through filters**
- ▶ **Pool filter backwashing.**

Remember: Wave machines, water spouts, fountains and flumes in constant use will increase your electricity bill

Staff awareness

Ensure staff members are aware of optimum operating temperatures for the pool. They should be trained to use controls effectively – ‘too cold’ can cause as many problems as ‘too hot’ in these areas. It is also important to ensure that the pool hall air temperature is controlled correctly. This should be maintained at 1°C above the water temperature to limit evaporation from the pool surface.

Minimum temperatures

With care, centres can maintain water temperature at the minimum level while still meeting comfort conditions.

Temperatures should range from 25-27°C for competition pools and up to 40°C for spa pools. See Figure 6 (below) for further details.

Figure 6 Maximum recommended pool water temperatures

Pool type	Temp (°C)
Training and competition	25-27
Conventional	28
Diving	28
Leisure	29
Teaching	29
Hydrotherapy	32-40
Spa	40

fact:

Overheating of pool water can cause excessive condensation which may increase the risk of damage to the building fabric. Always consult a qualified expert.

Schedule backwashes

Maintain an appropriate interval between consecutive backwashes of a pool filter to reduce energy and water consumption. Backwashing is very costly in both water and energy terms so any reductions in this area will lead to significant savings. The interval will depend on the type of pool and the degree of usage. Cyclic backwashes are often recommended but some manufacturers advise that the pressure drop across a filter should be used as an indicator of when a backwash is required. Always consult the manufacturer of your pool equipment if you are considering changing the maintenance regime.

Further information can be found in HSE guidelines at www.hse.gov.uk

Install a pool cover to cut total pool energy use by 10-30%

The installation of a cover reduces heat losses by 10-30% of the total pool energy use. When a pool cover is in operation, pool hall ventilation can be reduced without a resulting rise in relative humidity. A correctly installed pool cover also allows for the temperature of the pool hall to be decreased overnight without adversely affecting the water temperature. Initial installation costs are offset with a payback period of 18 months to three years.

Explore solar water heating potential

Solar water heating can be very effective for swimming pools and is relatively easy to connect to a conventional heating system. Unglazed solar collectors perform well in summer and are generally the cheapest to buy and install. Glazed collectors provide more energy in spring and autumn and can give a substantial contribution to pool heating throughout the year, with the remainder provided by a conventional heating system.

CASE STUDY

What are other centre managers doing?

- ▶ The installation of a semi-automatic pool cover at a leisure centre in Wales saved 22% of the centre's energy consumption and 15% of its costs. Once fitted, the cover saved over £9,000 per year and paid for itself in just over 18 months. Following this success, the county council went on to fit pool covers at three other leisure centres and in school swimming pools.
- ▶ A leisure centre in the South-West of England has had electronic equipment fitted to assist with control of its swimming pool pump motors. This technology has been in use for a long time in the water industry but only rarely in pools until recently. It is expected to save nearly £7,000 a year.

fact:

Manual, semi-automatic or automatic covers are available in a variety of shapes to fit most pools. Ideally, the entire pool surface should be completely covered although any significant reduction in exposed water surface area will result in savings. Remember to put a cover on your spa pool or jacuzzi too. Case studies have shown that where a full cover is fitted, ventilation has been switched off at night without any condensation problems occurring. A special type of control called a 'humidistat' can be fitted within the pool hall to ensure that ventilation is switched on only if relative humidity within the hall rises above 65-70%.

► Electrical equipment

Annual electricity spend by UK leisure centres accounts for approximately 25-30% of their total energy use. As electricity is typically four to five times more expensive than gas, this can represent as much as 60% of the total energy cost. Electricity is also responsible for more than twice the carbon emissions of gas so reducing consumption has both cost and environmental benefits.

Customer demand for gyms has increased, as has the demand for electronic fitness equipment. On top of this, such energy-intensive equipment is often situated in separate air-conditioned rooms. There are a number of ways to minimise energy consumption in this area whilst still maintaining the same level of service. Advice given applies equally to electrical equipment in health suites, office areas and on-site cafeterias.

Match demand to supply

At quieter times of day, ensure some machines and gym equipment are switched off to save on energy and costs. Always switch apparatus off at night along with air conditioning.

Maintain gym equipment regularly

Keep moving parts clean and free of dust and blockages and follow manufacturers' advice on equipment servicing schedules in order to maintain optimum performance – and optimum efficiency.

Fit plug-in seven-day timers to as much equipment as possible, to switch equipment on and off at programmed times throughout the week, especially communal facilities such as printers and photocopiers. Seven-day timers can also reduce energy consumed by water coolers, vending and gaming machines by up to 70%. However, before fitting them, it is a good idea to check with your supplier about service agreements.

Standby to save energy

Many electrical items have power down modes which reduce energy consumption and heat produced by the equipment. Always ensure this mode is enabled in order to save energy and lower cooling costs. Equipment lifespan will be extended meaning lower maintenance costs and fewer breakdowns. Be sure to post notices so that your customers know how to power up equipment, and do not just assume it is out of order.

Purchase the most efficient exercise equipment available

Generally, the more energy that is required to run apparatus, the more heat is emitted and the higher the energy costs will be. This will in turn increase the cost of cooling the area too. Opt for equipment that is powered by user activity where possible.

Keep a lid on catering costs

Many sports and leisure centres offer café facilities and although these offer additional revenue, they can also substantially increase a centre's energy bill. By following some good housekeeping advice, catering operations can identify savings:

- ▶ Switch off grills, fryers and hobs immediately after use
- ▶ Encourage staff to use the right size of saucepan for their cooking needs
- ▶ Avoid overfilling saucepans and kettles and use lids where possible
- ▶ Don't switch on too soon – most modern catering equipment reaches optimum temperature quickly. Label equipment with its pre-heat time and educate staff to switch on only when required
- ▶ Keep fridge and freezer doors closed and defrost regularly to save energy and prolong equipment lifetime
- ▶ Consider switching off chilled display cabinets overnight (as long as this does not affect product quality).

top tips:

When purchasing or leasing a new hot drinks vending machine, ensure that it:

- Requires the minimal amount of water and only heats it when required
- Can be controlled using a programmed seven-day time switch
- Has low idling power requirements, high levels of insulation and low levels of lighting
- Allows users to use their own mugs.

Motors and consumption

Electrical energy consumption of motors in fans, pumps and pool water systems in sports and leisure centres is considerable. For example, a typical 11kW induction motor in a pool circulation pump, costing £300 to buy, could build up a running cost of up to £30,000 from continuous operation over its lifetime. Good housekeeping and correct maintenance are essential with this equipment:

- ▶ Ensure that motors and the fans and pumps they drive are switched off where possible
- ▶ Use the automatic controls of fans and pumps to reduce running costs
- ▶ Install dual speed motors or variable speed drives (VSDs) to cut energy costs.

High efficiency motors should always be considered as they often have no additional capital cost and they offer efficiency and economic benefits in virtually all situations. By purchasing a high efficiency motor instead of having the motor rewound, you could save more than £3,000 for a motor life of 15 years.

Contact the Carbon Trust for more information about motors, fans and pumps.

fact:

If left on continuously, a typical vending machine can cost around £200 per year in energy.

▶ Building fabric

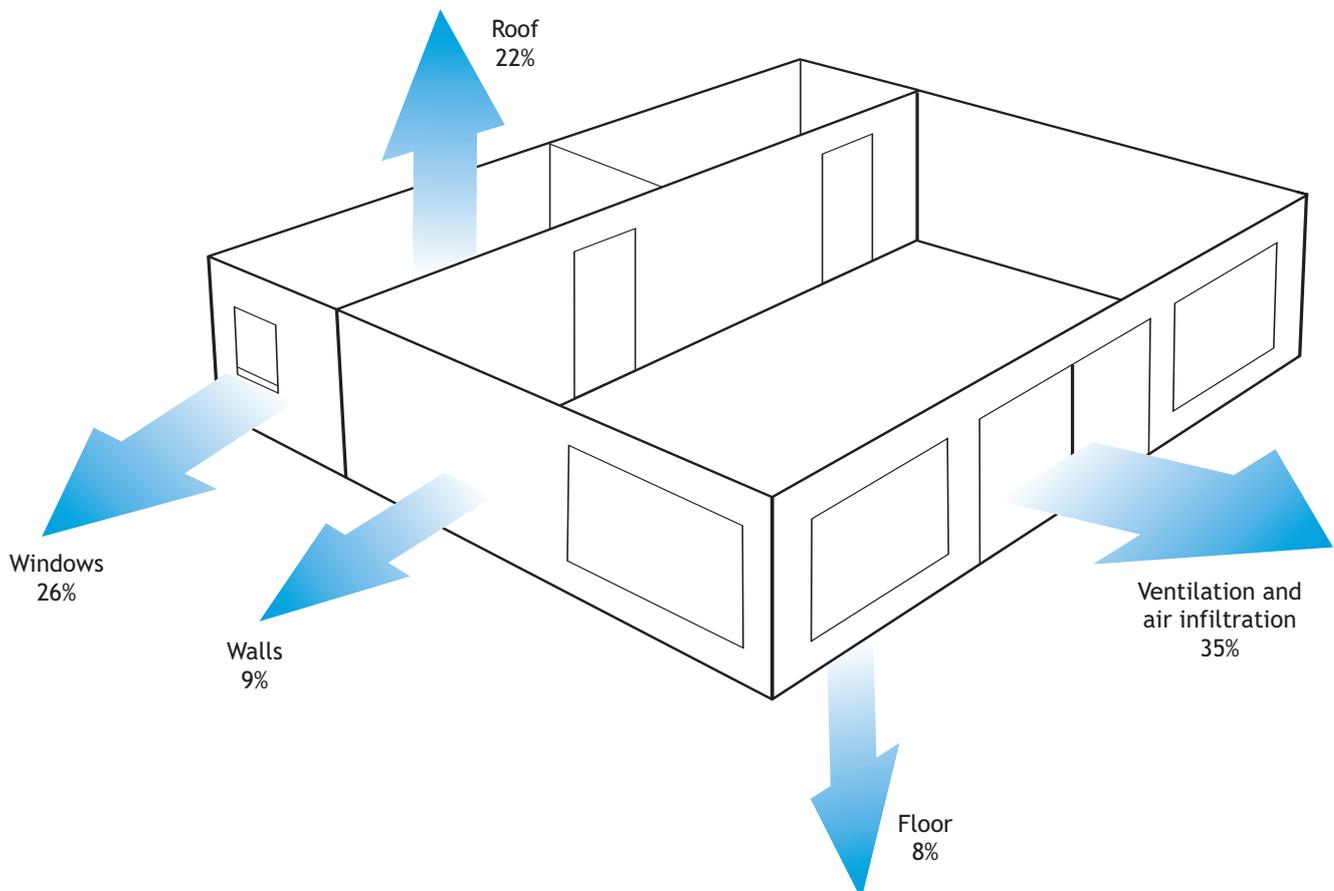
Typically, two thirds of heat from a building is lost through the building fabric, with the remaining third being lost through air infiltration and ventilation.

The rate at which heat is lost depends on:

- ▶ The temperature difference between inside and outside
- ▶ The insulation properties of the building fabric
- ▶ The amount of fresh air entering the building either by controlled ventilation or through poorly fitting windows, doors or joins in walls.

Improving a building's fabric makes good sense for many reasons:

- ▶ Greater temperature control – it can lower ventilation costs and prevent overheating
- ▶ Better conditions – staff morale can be improved by providing a more comfortable working environment through reducing draughts, solar glare, overheating and noise
- ▶ Lower capital expenditure – a more efficient, well-insulated centre needs smaller heating and cooling facilities
- ▶ Good investment – better insulation and well-kept building fabric can increase a centre's value and attractiveness to customers.



Undertake regular maintenance

Regular maintenance can help you avoid expensive problems later on. Any potential problems should be identified and dealt with promptly, as part of a maintenance schedule. In particular, gaps or holes in walls, windows, doors and skylights should be repaired immediately. This provides instant savings and also improves the appearance of the centre. It is more comfortable for customers too.

Establish a housekeeping schedule and involve staff

Compile a regular checklist to address areas where energy is lost via the building structure. The larger a building, the more beneficial it would be to appoint staff to carry this out. A comprehensive schedule should include checking window panes, frames and roof lights.

Regularly check the building for damp

Damp causes significant damage to the building structure and reduces its insulating properties. Repair split down-pipes, faulty gutters and leaky roof tiles. Check for signs of damp and condensation at least once a year, preferably prior to winter months.

Insulate to accumulate

25% of a building's heat will escape via an un-insulated roof which adds hundreds of pounds per year to heating bills. Insulation can stop much of this escaping, meaning that centres need less heating energy to keep customers warm.

Insulation should measure at least 200mm deep in roof spaces and 75mm elsewhere. Insulate hot internal pipes to 25mm and external pipes to 50mm using weatherproof insulation – and don't forget valves and flanges. Contact the Carbon Trust for more information.

Upgrading building fabric during refurbishment projects

Refurbishment offers an excellent opportunity to upgrade windows, doors and insulation. This is because energy saving measures taken at this time can minimise costs and disruption to staff and customers.

▶▶▶ Energy Efficiency Loans

The Carbon Trust can provide an energy efficiency loan to SMEs in England and Wales of up to £100,000* and for all businesses in Northern Ireland of up to £200,000 for investment in energy saving projects such as the upgrading or replacement of lighting, boilers or insulation. The loans are interest-free, unsecured, repayable over a term of up to four years and with no arrangement fees. In Scotland, the Scottish Executive offers a similar scheme called 'Loan Action Scotland'.

*Subject to terms and conditions and local funding.

▶ Good housekeeping and energy management

Savings are easily achievable in all leisure centres and need not require any initial outlay. Many opportunities are within the control of staff and customers.

Everyone should be reminded that good energy management helps to achieve:

- ▶ Healthier and more productive working conditions
- ▶ A more attractive environment for leisure centre customers
- ▶ Cost savings.

Whether starting an energy conservation programme from scratch or simply checking the effectiveness of an existing management system, there are a number of basics to consider.

Responsibility and commitment

Commitment to energy efficiency has to come from the top and should be backed up by a personalised mission statement and energy policy. It is also important to appoint a staff member to be responsible for efficiency in the centre. This will often improve involvement and awareness across the whole building.

Involve staff

All staff are important in saving energy so they must be made aware of wastage areas and be trained to operate equipment and controls correctly. Motivate staff – ask their opinions and encourage them to review their own working practices to increase energy savings. Competitions, campaigns and team projects are great ways to get buy-in. Reinforce the benefits of improving their work area and give them a sense of ownership of energy management.

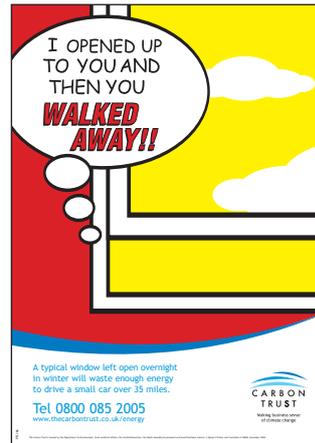
The Carbon Trust's *Creating an awareness campaign* (CTG001) includes a staff survey, useful tips, posters and stickers.

hot tip:

Maintenance contractors

If you employ maintenance contractors, make sure you ask them to keep room conditions at their optimum whilst minimising energy and maintenance costs.

Examples of Carbon Trust posters



PFL166



PFL165

Monitor energy use

Understand your energy consumption by reviewing energy bills over the last year – you should be able to build a picture of your monthly performance. Larger centres generally have meters recording half-hourly electricity consumption and these data should be available from your energy supplier for comparison with your bills. However, if your centre does not have a half-hourly electricity meter, you should check and record monthly meter readings yourself. It is also advisable to check and record your monthly gas consumption in the same way.

Consider a Building Energy Management System (BMS or BEMS)

A BEMS is based on a network of controllers and offers closer control and monitoring of building services performance, including heating, ventilation and air conditioning. This is shown on a computer screen in real time and allows settings to be changed quickly and easily. BEMS can reduce total energy costs by 10% or more so they are well worth considering for larger centres.

Set targets

Tell staff how much energy is currently being consumed. As the energy saving programme gathers momentum, it will be possible to track progress and highlight energy savings. Set targets – most businesses in the UK could reduce their energy consumption by 10-40%. However, it is important to be realistic: many organisations start with 5% per year.

Undertake regular housekeeping walk rounds

Carry out regular good housekeeping walk rounds. Note down and act on any maintenance measures needed in order to avoid expensive problems later on. As patterns of energy use vary throughout the day, it is advisable to carry out a series of walk rounds at different times to get a better idea of where and when energy is being wasted. A walk round helps to:

- ▶ Establish current operating practices
- ▶ Eliminate wasteful practices and ensure they do not recur
- ▶ Demonstrate commitment to improving energy performance
- ▶ Identify opportunities for savings
- ▶ Involve site staff and users of the facilities.

Find an example of a walk round checklist on page 22, or get further ideas from the Carbon Trust's leaflet *Assessing the energy use in your building* (CTL003).

Consider investing in portable temperature recording equipment to allow for the accurate checking of air and water temperatures as part of a walk round. These temperatures should be checked and documented against a schedule of preferred conditions for different spaces in the centre.

Examples of free stickers available from the Carbon Trust



»»» What are other centre managers doing?

Some leisure centres managed by Knowsley Metropolitan Borough Council now use a new real-time energy monitoring system (see Figure 8 right).

“The new electronic system is a most useful tool, showing consumption data from up to several months at a time on one computer screen. This enables erroneous patterns of usage to be spotted and corrected.”

Barry McKean, Knowsley Metropolitan Borough Council, Energy Institute Energy Manager of the Year 2004.

Combined with staff training and awareness-raising, the Council has saved 24% of electricity and 30% of gas used at leisure centre sites.

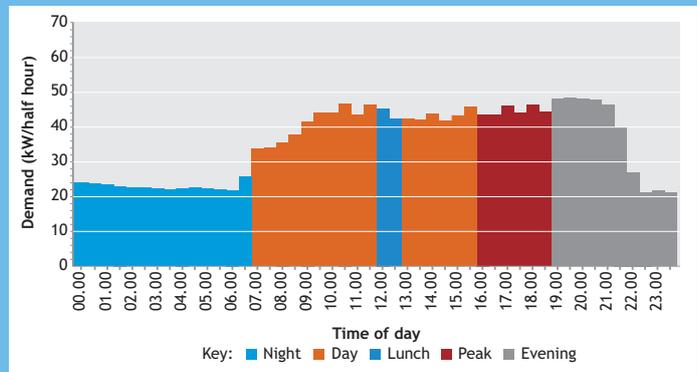


Figure 8 In-depth computerised energy use data generated by Knowsley Metropolitan Borough Council's real-time energy monitoring system. It clearly shows when energy is being used in the centres. In comparing this with the business operations, such as opening times and peak customer usage, the centre could identify how much energy is being used and whether it is unnecessary. By understanding this, it became possible to take action to minimise energy waste and save money.

Benchmarking

Benchmarking allows a leisure centre to compare its energy performance with other similar centres across the UK and over time, with its own previous performance. Calculating a benchmark based on energy consumption per unit of floor area of a building allows direct comparison with other centres, giving an idea of how energy efficient the centre is. Typical floor area consumptions for different leisure facilities are shown in Figure 9.

The normal units of an energy benchmark are kWh of energy used per square metre of floor area (kWh/m²) measured over one year. During the calculation, an account of local weather conditions is also factored in as this will affect the energy needed to heat a building.

The benchmarks are similar to those used in measuring energy consumption in a car (for example miles per gallon). Energy consumption benchmarks for each type of pool building are shown below. Please note that these figures are for the whole pool building and not only the pool area. The typical value is the median value of the data. This is the value for which 50% of data points will be higher and 50% lower.

If, say, your centre's fossil fuel (usually gas or oil) benchmarks are typical for a facility of its type but your electricity use is much higher, it makes sense to investigate electricity use first. The difference between your energy use and 'good practice' (energy performance found in a well-performing centre) gives an indication of the extent of savings that may be available. Multiply this by the price you pay per unit of fuel or electricity to find the potential cost saving.

fact:

Benchmarking not only allows you to see how well you are doing, it also helps to identify potential savings and areas where you should focus your efforts.

Figure 9 Energy consumption benchmarks for leisure facilities

Type	Good practice – fossil fuel (kWh/m ² /yr)	Good practice – electricity (kWh/m ² /yr)	Typical – fossil fuel (kWh/m ² /yr)	Typical – electricity (kWh/m ² /yr)
Centre with 25m Swimming pool	573	152	1336	237
Centre with leisure pool	573	164	1321	258
Combined centre (with more than one type of facility)	264	96	598	152

Action checklist

Date of inspection

Check all areas within your facility and note items that need attention

Main sports and leisure centre areas	✓ Checked	Further action required?	Comments
Measure temperatures regularly and check these against a list of preferred conditions			
Check for complaints about comfort conditions and report			
Check that heating controls/room thermostats are correctly set			
Ensure that lights are switched off when there is sufficient daylight			
Ensure that windows and doors are closed in heated areas			
Pool areas			
Check pool covers are used at the end of the day, including spa pools			
Check the pool hall air temperature is 1°C above the water temperature			
Check that sauna and steam rooms are off at the end of the day			
Check that hoses used to rinse poolside areas are fully turned off when not in use			
Fitness rooms			
Ensure air conditioning and/or heating is switched off at the end of the day			
Turn on air conditioning or heating as late as possible to meet comfort conditions			
Turn off all equipment overnight or when not in use			
Changing rooms			
Check hot water temperatures			
Turn off fans and lights at the end of the day			
Turn off unused taps or showers at regular intervals			
External areas			
Check external lighting is off during the day			
Use floodlights only when there are customers using the external facilities			

Next steps

Start with the following easy low and no-cost options to help save money and improve the energy performance of your leisure centre:

▶ **Step 1. Understand your energy use**

Look at your centre and identify the major areas of energy consumption. Check the condition and operation of equipment and monitor the power consumption over one week to obtain a base figure against which energy improvements can be measured.

▶ **Step 2. Identify opportunities**

Compile an energy checklist. Walk round your building and complete the checklist at different times of day (including after hours) to identify where energy savings can be made. An example checklist can be found on the previous page and further ideas are available in *Assessing the energy use in your building*, (CTL003), from the Carbon Trust.

▶ **Step 3. Prioritise your actions**

Draw up an action plan detailing a schedule of improvements that need to be made and when, along with who will be responsible for them.

▶ **Step 4. Seek specialist help**

It may be possible to implement some energy saving measures in-house but others may require specialist help. Discuss the more complex or expensive options with a qualified technician.

▶ **Step 5. Make the changes and measure the savings**

Implement your energy saving actions and measure against original consumption figures. This will assist future management decisions regarding your energy priorities.

▶ **Step 6. Continue managing energy efficiency**

Enforce policies, systems and procedures to ensure your centre operates efficiently and that savings are maintained in the future.

Related publications

The following publications are available from the Carbon Trust:

Fact sheets

How to monitor your energy use (GIL157)

Understanding your energy consumption (CTL001)

Assessing the energy use in your building (CTL003)

How to select a variable speed drive (GIL152)

Overviews

Heating, ventilation and air conditioning (CTV003)

Low temperature hot water boilers (CTV008)

Guides

Heating control (CTG002)

Creating an awareness campaign (CTG001)

▶▶▶ To order any of the publications listed above, or for further information relevant to the sports and leisure industry and the technologies outlined, contact the Carbon Trust on **0800 085 2005** or visit www.carbontrust.co.uk/energy

For further information...

▶▶▶ call the Carbon Trust on 0800 085 2005

You'll find free advice on what your organisation can do to save energy and save money. Our team handles questions ranging from straightforward requests for information to in-depth technical queries about particular technologies and deals with all kinds of energy saving topics for people at all levels of experience.



▶▶▶ www.carbontrust.co.uk/energy

All of our publications are available to order or download from the Carbon Trust website at www.carbontrust.co.uk/energy. The site provides a range of information suited to every level of experience including top tips, action plans, forthcoming events and details of the range of services available from the Carbon Trust.



▶▶▶ receive free publications

The Carbon Trust has a comprehensive library of energy saving publications. For more information on your sector, technologies within your sector and the technologies listed in this guide, please visit our website or phone us.



www.carbontrust.co.uk/energy
0800 085 2005

The Carbon Trust works with business and the public sector to cut carbon emissions and capture the commercial potential of low carbon technologies.

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Making business sense
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CTV006