CTV020 Sector Overview

Further and higher education

Training colleges and universities to be energy efficient

CARBON TRUST

Making business sense of climate change

Contents

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 organisations 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 buildings in the further and higher education sector and demonstrates how simple actions save energy, cut costs and increase profit margins.

Introduction

Annual energy costs for the FHE sector are around £200M, resulting in CO_2 emissions of around 3½ million tonnes per year. It is, however, possible to reduce these emissions by around 20%.

Further and higher education (FHE) is a growing sector, with student numbers increasing by a factor of five over the past thirty years. This means that the energy consumption of colleges and universities is also growing. Establishments are under constant pressure to provide optimum learning facilities on a limited budget so it makes sense to look at the way energy is used in order to release much needed additional funds for curricular resources.

Implementing a few simple techniques can reduce energy consumption. It will also boost the environmental credentials of a college or university, which could influence the number and calibre of students attracted and retained.

In addition to economic benefits, there are social and environmental advantages to reducing energy consumption, such as preserving fossil fuels and minimising climate change.

Who is this publication for?

Many people can benefit from the advice in this publication — from site managers and maintenance staff to governors, administrators and teaching staff. Focusing on low and no-cost measures with quick paybacks, this overview will help to:

- Assess the potential for energy savings and indicate key areas for improvement
- Raise awareness and motivate action amongst the whole college or university community
- Prioritise activities to maximise savings.

Many energy saving measures do not require any capital outlay and can reap significant benefits such as:

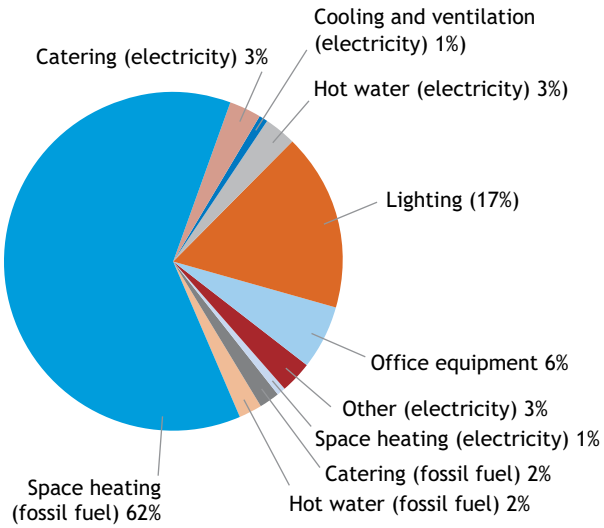
- Reduced fuel and maintenance costs
- Enhanced learning environments
- Improved comfort conditions which can boost student productivity and morale.

There is also the opportunity to sell the social responsibility elements of energy management to current and prospective students, enhancing curricular activity and encouraging future generations to help minimise climate change.

Energy consumption in the FHE sector

Energy efficiency is a major component of environmental management within FHE institutions. Annual energy costs for the FHE sector are around £200M, resulting in CO_2 emissions of around 3.2 million tonnes per year. It is, however, possible to reduce these emissions by a fifth. Some of these savings could be achieved with little or no capital outlay, simply by making operational changes.

***Figure 1** FHE – percentage energy use*



REMEMBER:

Money saved from implementing low and no-cost energy efficiency improvements can be set aside to fund more expensive measures.

Increasing demand means higher costs

Energy use in FHE is rising due to widespread use of IT equipment which has increased electricity demand. Moreover, FHE buildings are also being used by local communities, thus increasing occupancy hours and the use of facilities. This, in turn, consumes more heating and lighting, leading to escalating energy bills.

Energy consumption in the FHE sector typically accounts for about 2.5% of its annual revenue budget. Most of this energy is used for heating and lighting. The other energy costs of an FHE establishment are largely determined by its facilities. Those with leisure centres, residential accommodation or large science/biomedical facilities consume more energy and therefore have higher operating costs.

fact:

Although two thirds of the energy consumed by the FHE sector is made up of fossil fuels, electricity accounts for around 60% of energy costs.

CASE STUDY

What other institutions are doing: University of Wales

Image courtesy of the University of Wales.

For the last four years, the University of Wales, Aberystwyth, has led an innovative first year undergraduate exercise in climate change. Whilst the exercise has been very successful in providing students with some insight into the complex issues around global climate change, it has other important benefits also.

First year Human Geography undergraduates, within three weeks of starting at the university, are taken off-campus for an intensive weekend exercise — 'Global Warming: The World Summit'. The exercise links to one of the first year course modules, Development and the Environment, although its outcomes go wider.

Each student is given a briefing pack on carbon emissions, and on one of the eight countries represented at the Summit. The packs explain the basic science of global warming, the economic and environmental implications of different levels of atmospheric CO_2 concentration, and some of the economic parameters of the individual countries represented. Students effectively take on the role of climate change negotiators and seek to agree emissions caps for different countries from the developed and developing world.

Feedback from students shows the weekends have been extremely valuable in raising awareness of the urgent need for action on climate change, as well as demonstrating the complexity and difficulty of achieving it in the international arena. Other valuable aspects of the weekend include stretching the students intellectually and bringing them together socially, which can help them develop confidence.

It is hard to measure whether the exercise encourages students to become agents for change on carbon emissions within the university itself. However, through courses like this, both staff and students become more aware of the issues affecting their local and global environments.

Opportunities for energy saving

Building fabric

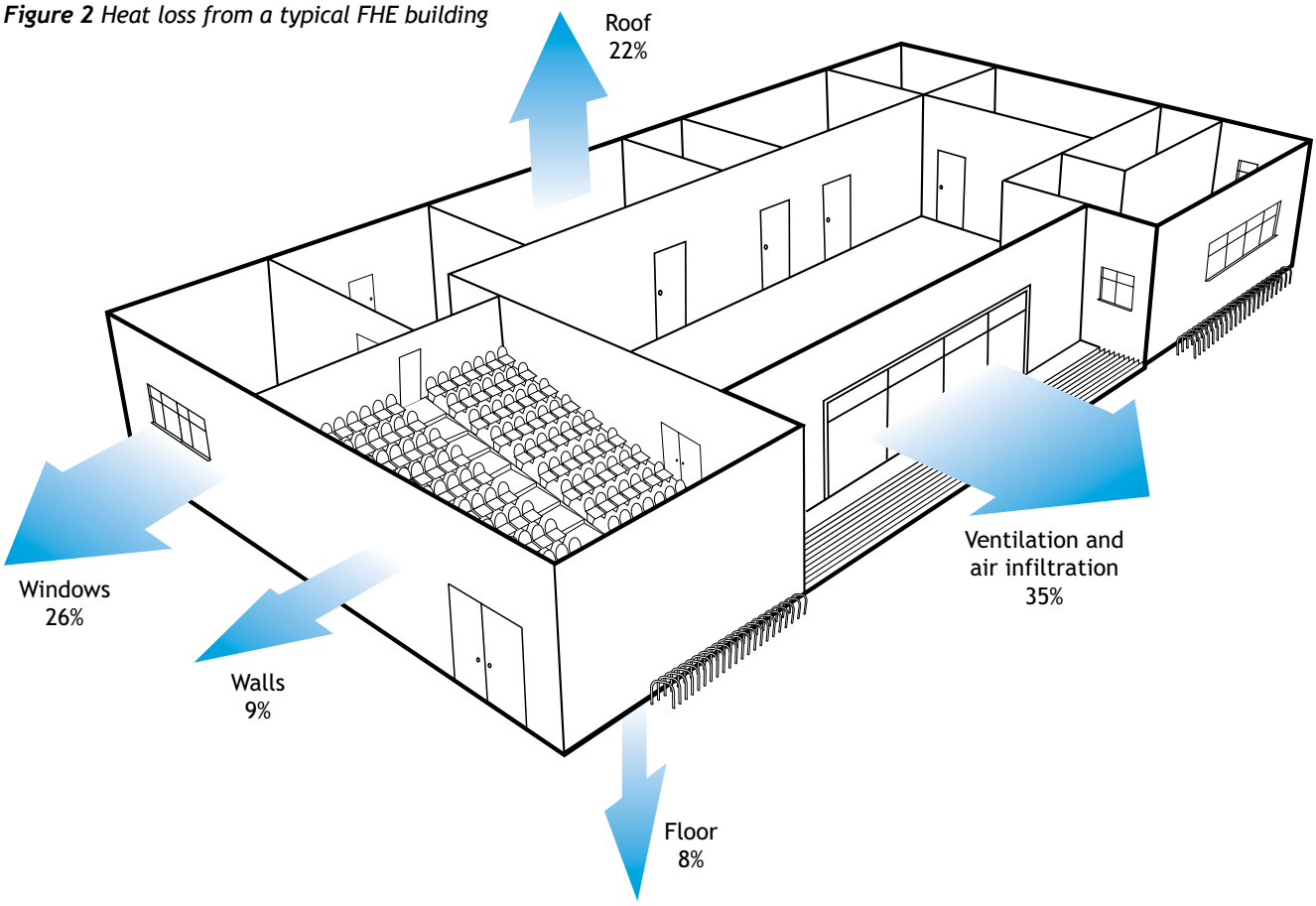
Although there is a wide variety of buildings types in the sector, improving and maintaining building fabric is a chief source of energy saving across the board.

Around two thirds of the energy consumed in a typical college or university building is used to replace heat lost through the building fabric (walls, floors and ceilings) and through ventilation. There are some simple key measures requiring very little outlay that can significantly improve comfort levels so it makes good sense to make improvements in this area first.

Improving building fabric makes good sense for the following reasons:

- Better temperature control – it can lower ventilation costs and prevent overheating
- Improved comfort for students and staff – the learning experience can be enhanced by providing a more comfortable environment through reducing draughts, solar glare, overheating and noise
- Lower capital expenditure – a more efficient, well-insulated building needs smaller heating and cooling systems.

Figure 2 *Heat loss from a typical FHE building*



Understand the campus usage

In order to evaluate energy consumption and identify potential wastage areas, it is first necessary to understand the types of building on a college campus and how they are utilised.

Dense, transient occupancy in, for example, refectories can require more energy intensive services such as mechanical ventilation or comfort cooling. However, smaller rooms used for more sedentary activities, such as resource centres and tutorial rooms, house less people and can therefore be managed using basic heating and cooling controls only.

The broad mix of building types found in colleges and universities makes it impossible to apply a single energy efficiency plan across the board. However, the following basic measures can be taken to improve internal comfort conditions throughout FHE buildings.

Establish a housekeeping schedule

Compile a checklist to address areas where energy is lost via the building structure. It is a good idea to appoint a specific staff member to conduct walk rounds using the checklist at the back of this publication — a comprehensive schedule should include checking window panes and frames, skylights, roofs, skirting and eaves. Scheduled checks could be undertaken alongside an energy walk round (see page 27).

Undertake regular maintenance

Where faults are found, deal with them promptly. This will help avoid more expensive problems later on. Gaps or holes in walls, windows, doors and skylights in particular, should be repaired immediately. Install draught stripping to windows and doors, check for signs of damage or damp and replace when required.

Regularly check buildings 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.

Check and maintain insulation

Hot water and heating pipes should be insulated, as should any accessible loft spaces. Check insulation is in good condition and replace it if required. Insulating pipes can also improve internal comfort by reducing the risk of unwanted heat gains.

Use curtains and blinds

Close curtains and blinds at the end of the day during winter months to reduce draughts and help the room retain more of its residual heat overnight. Curtains and blinds can also help in summer by reflecting heat from direct sunlight, thus reducing unwanted heat gains. Blinds can also be an effective way of controlling daylight, glare and disruptive noise. This can be particularly important during exam time.

top tip:

— Conduct building fabric checks during and after inclement weather conditions. Bad weather can make problems like leaks and gaps obvious.

— Keep windows and external doors closed as much as possible when heating is on and consider sealing unused doors or windows to further reduce draughts.

Improve glazing

Double glazing is a minimum requirement when replacing windows but specifying triple glazing on north facing or exposed sides of a building can offer further comfort and energy savings. Some window units even have integrated blinds and/or allow for secure night opening which can provide additional ventilation and cooling benefits.

High performance glass has a coating applied that improves its insulation properties. Coatings that allow daylight through but block or reduce heat (infrared) can limit the effects of heat gains from direct sunlight. In turn, this can lead to a decreased need for mechanical cooling.

Highly glazed spaces are a particularly common feature of 1960s buildings which house many FHE establishments today. In these areas, it may be more effective to replace some of the glazing with insulated blank panels. This will reduce the amount of light entering the space but provide better insulation and reduce heat and glare problems associated with large glazed areas.

Install more insulation during refurbishment

Around a quarter of a building's heat will escape via an uninsulated roof, which adds hundreds of pounds per year to heating bills. Insulating any roof spaces and unfilled external cavity walls is an effective and inexpensive way of reducing heat losses.

Many educational buildings have flat roofs and single-skinned external walls making insulation measures more disruptive and costly. Improvements to these are most cost effective during refurbishment projects and should always be considered when the opportunity arises.

Draught lobbies

Installing a draught lobby at frequently used entrances can reduce heating costs and draughts. In the winter, it can help keep warm air in and cold air out, and the reverse is true during summer months. Lobbies should be large enough to provide unrestricted access and enable one set of doors to be closed before the other is opened. Where possible, the two sets of doors should have automatic control to ensure that they are closed properly.

More information on all of these actions and more are available in *Building fabric* (CTV014), available from the Carbon Trust.

Designing for efficiency in new build and refurbishment projects

The best time to maximise energy efficiency potential is during the design process for new buildings or during any refurbishment projects. Passive design features such as building orientation and positioning of ventilation and windows should primarily be considered. Another main design objective should be to minimise the amount of energy needed to run building services and then use as much naturally occurring energy as possible to provide this. Designs should take full advantage of natural daylight heat from the sun to warm the building and natural ventilation.

fact:

There are approximately 100 universities in the UK (excluding constituent colleges) and more than 500 further education colleges. Around 250 new buildings are constructed each year within universities alone. Designing new buildings and refurbishment projects to be as energy efficient as possible can save significant amounts of energy in the long term.

Heating

On average, FHE buildings use about 3300 kWh/student/year in providing heating and hot water which accounts for 65% of total energy used. Significant savings can be achieved by maintaining appropriate internal temperatures and ensuring that heating equipment and controls are operated and managed correctly.

Recommended temperature ranges for the types of room typically found in FHE establishments are:

- Offices — 19-24°C
- Workshops — 16°C
- Stores — 10-12°C
- Teaching buildings — 19-21°C
- Residential accommodation — 19-24°C.[1]

> For every 1°C of overheating, fuel consumption will increase by 8-10%.

Obtain feedback

Encourage staff and students to report any areas that are too hot, cold or draughty. Investigating problem areas can help to identify maintenance issues. If these issues are addressed, staff and students are less likely to open windows whilst heating or cooling is on, or request portable electric heaters or fans to make the space more comfortable. All of these increase energy consumption and are a sign that something is wrong.

Students attend lectures in various buildings on campus throughout the working day. Use this opportunity to find out their thoughts on which room or lecture theatre provides the best learning environment and why. A simple questionnaire survey can be useful to help pinpoint problems to be addressed.

Ensure controls match building occupancy

Check that heating system operating hours match the times when heating and ventilation are required, as needs vary throughout the day. Use simple time switches in smaller rooms 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.

Check thermostats are not influenced by draughts, sunlight or internal heat sources like radiators or ICT equipment. Make sure settings reflect the activity taking place in the space. As part of a larger communications programme, discourage staff from using them as on/off switches — turning to maximum does not speed up the heating process, it just ensures that the space will overheat.

fact:

FHE buildings have sporadic occupancy patterns so it is important to regularly review timers to ensure they are set correctly. Timers should be adjusted so that buildings reach optimum temperature just as people arrive and that they begin to cool down before people leave. This is best done by gradually altering settings over a number of days and checking the response of the building and its occupants. If a building is occupied for different periods over the week, install seven-day timers to allow the systems to operate only when the building is likely to be occupied.

[1] Source: Adapted from Environmental Design Guide A, CIBSE, 2006.

CASE STUDY

What other institutions are doing

One university's heating system was coming on at 1am to provide correct temperatures for the start of the day. This setting was slowly adjusted over time and now the heating comes on at 5am, providing appropriate temperatures without compromising the comfort of staff and students. This has resulted in a significant heat-energy saving of over four hours a day during winter months, saving hundreds of pounds each year across the whole site.

Keep systems clear and unobstructed

FHE buildings commonly have multi-purpose rooms to accommodate the many activities that campuses run. As such, furniture is constantly being rearranged to suit the students' needs. Regularly check radiators and vents to make sure that they are not obstructed. This ensures better circulation of heat into the space and reduces the energy required to meet the heating demand.

Maintain boilers and pipework

Have boilers serviced by a reputable firm. Gas-fired boilers should be serviced once a year; oil boilers twice a year. A properly 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.

top tip:

An uninsulated valve loses the same amount of heat as a metre of uninsulated pipe. So when insulating pipes, make sure to install removable insulation 'jackets' to flanges and valves. Replace them regularly as part of ongoing maintenance.

Upgrade controls

Heating system control can be problematic with old, inefficient time controls. Upgrades are well worth implementing as they can pay for themselves quickly through energy and cost savings.

New heating systems can adjust themselves in line with the changeable UK weather. 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 usually pay back their investment in just a couple of years. Consult a qualified heating technician to discuss the range of options available. See the *Heating control* technology guide (CTG002) available from the Carbon Trust.

Install heating zones

Take account of areas with similar heating requirements within a building when configuring a heating system or during refurbishment. Set up controls to reflect similar patterns of use, such as for temperature and time requirements. It is possible to independently control separate 'zones' to reflect their differing requirements. This will save money and improve comfort.

Although libraries, lecture halls and canteens are often centrally controlled to incorporate varying occupancy patterns, one-person dormitory rooms and single occupancy offices are under the control of the occupant. Having the most appropriate control strategy for each space is essential so it is therefore important that all building users understand how to operate basic controls.

To order a copy of the technology guide *Heating control* (CTG002) contact the Carbon Trust (details inside the back cover).

Recover heat from exhaust air

It costs money to heat the air inside a building and it may be possible to reclaim some of that energy. The simplest way to recover heat from exhaust air is to simply re-circulate a proportion of the exhaust air along with fresh air to maintain air quality. The ratio of re-circulated air to incoming fresh air will be dependent on the air quality requirements and this can be controlled using an indoor air quality sensor. More advanced solutions are available which allow the heat from exhaust air to be used to pre-treat fresh incoming air. This is a worthwhile technology — contact the Carbon Trust for further information.

Consider combined heat and power (CHP)

On sites with high or constant heat demands throughout the year — such as universities with swimming pools — it may be beneficial to operate a CHP plant. Further information is provided in the CHP section later in this guide (page 25).

Consider district heating opportunities

On sites with high or constant heat demands throughout the year, it may be beneficial to operate, or tie into, a district heating scheme also known as community heating. These systems use a sizable heat source, such as large centralised boiler plant to heat a number of discrete premises. Heat, usually in the form of hot water but also sometimes steam, is distributed from the central boiler plant to buildings via heavily insulated underground pipes. District heating systems can range in size from the energy linking of two or three buildings, through to city-based networks. It is worth investigating this option for FHE sites close to existing schemes or those with residential accommodation, swimming pools or dedicated research equipment requiring heat.

CASE STUDY

What other institutions are doing: University of Sussex

Image courtesy of the University of Sussex.

With an annual energy bill of more than £3.2 million and annual carbon emissions of approximately 8,000 tonnes, the University of Sussex decided to look at ways to improve its energy efficiency. By working with the Carbon Trust, the university has now identified ways to reduce carbon emissions by more than 3,900 tonnes over the next five years and to save over £450,000 in energy costs during this period.

A number of key priority actions were identified to achieve this, including:

- Installing energy efficient light bulbs in a large number of buildings
- Installing timing controllers to heating in several buildings.

Initiatives under consideration include:

- The installation of variable speed drives in various university buildings
- Fitting energy saving devices to refrigerators and freezers
- Fitting 1,000 thermostatic radiator valves to radiators
- Installation of automatic doors in a number of buildings.

These actions would offer combined savings of more than £110,000 per annum.

Ventilation and air cooling

As optimum comfort conditions are conducive to creating a productive learning environment, mechanical ventilation and air conditioning are increasingly specified for new FHE buildings, or retrofitted to older buildings during refurbishment.

Is air conditioning necessary?

Full air conditioning is not often required in most UK buildings and should only be considered when careful control of humidity is required. For general comfort cooling, investigate cheaper and more efficient options. A simple first step is to reduce internal heat gains from electrical equipment which can reduce strain on the cooling and ventilation systems — or may even eliminate the need for mechanical solutions altogether.

Natural ventilation and free cooling

Research suggests that many building occupants prefer well designed, naturally ventilated buildings to those with mechanical cooling. Natural ventilation and cooling relies on the normal airflow 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, allowing mechanical ventilation to be switched off or turned down to save money. When opening vents, doors and windows, always consider security implications.

Reduce air loss

It takes energy to heat or cool air. If that air escapes unnecessarily, such as through inefficient ventilation systems, or through opened windows and gaps in the building fabric, energy is wasted. It also means that more air must be brought in and heated or cooled to maintain optimum comfort conditions. Therefore, reducing unnecessary air loss will save on energy consumption and costs.

Night cooling

Use lower external temperatures at night to cool buildings ready for the following day, thus delaying the switching on of air conditioning. This is known as 'night cooling'. See the Carbon Trust's *Heating, ventilation and air conditioning* technology overview (CTV003) for more information.

Maintain system components

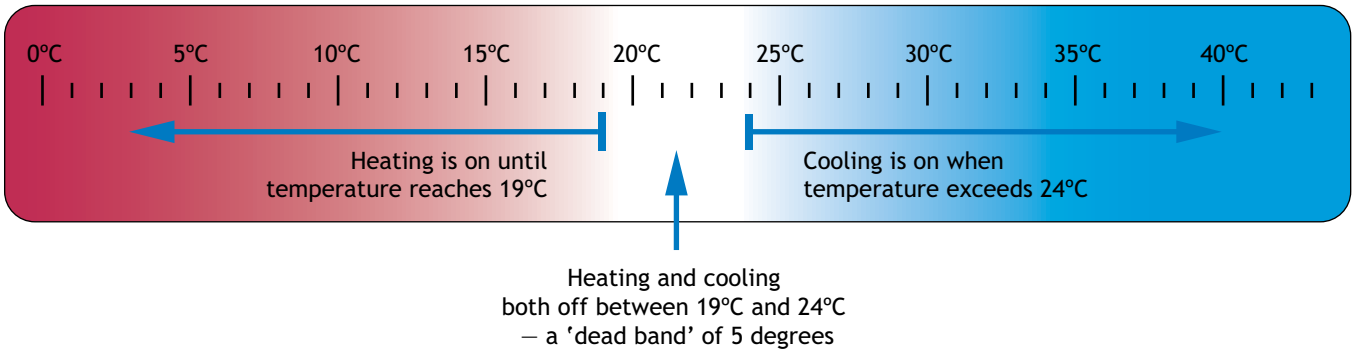
Dirty or faulty fans, air ducts and components can impair air quality and directly affect system efficiency, increasing running costs and the risk of breakdown. The performance of the whole system should be reviewed annually and replacement parts ordered as necessary. Always consult a maintenance technician.

Time controls and settings

Ventilation requirements may vary at different times and in different parts of a building throughout the day. Check that operating times for ventilation and cooling systems are consistent with the occupancy patterns of the building, unless ventilation is being used to provide cooling overnight.

For more information on cooling, refer to the technology guide *Air conditioning* (CTG005), available from the Carbon Trust (details can be found inside the back cover).

Figure 3 *Diagram of 'dead band' control providing recommended temperatures*



Eliminate heating and cooling overlap

Avoid letting heating and cooling operate at the same time by setting a temperature 'dead band' — a wide gap between the temperatures at which heating and cooling cut in. Figure 3 above shows an appropriate dead band. In this example, 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.

The Carbon Trust's *Air conditioning* technology guide (CTG005) provides more details on these actions and more.

top tip:

In cold weather, use the external temperature of the air to provide cooling and, thus reduce energy costs. Make sure that thermostats are set correctly so that chillers are off when they are not required.

Fit variable speed drives (VSDs)

In most FHE building ventilation systems, fans often do not need to operate at full speed all of the time. Variable speed drives (VSDs) can help to reduce costs by enabling the output speed of the fans to match requirements at different times of the day. This reduction in speed saves energy and there are corresponding heating and cooling cost savings too. VSDs can be applied to a variety of situations where a fan or motor is used, from large ventilation systems in university buildings through to kitchen ventilation and extraction in small college catering facilities.

For more information, order *Variable speed drives* technology guide (CTG006) available from the Carbon Trust.

Lighting

Good lighting is essential to create an effective learning environment.

FHE buildings are filled with multipurpose rooms that require different lighting levels at various times of the day and this can sometimes involve complex lighting control strategies. As a result, lighting could be consuming up to 20% of total energy costs in an FHE establishment. However, there is considerable scope for making savings by implementing some simple good housekeeping measures.

'Switch off' policy — involve staff and students

As students visit different buildings on-site throughout the day, they can play a vital role in helping to minimise energy consumption across campus. Similarly, teaching and cleaning staff can also contribute to making savings. Place stickers above light switches and posters around the building to remind everyone to do their bit.

Label light switches

Help staff and students select only those lights they need by labelling the switches clearly. Lights in unoccupied areas should be switched off but remember to consider health and safety implications, particularly in corridors and stairwells.

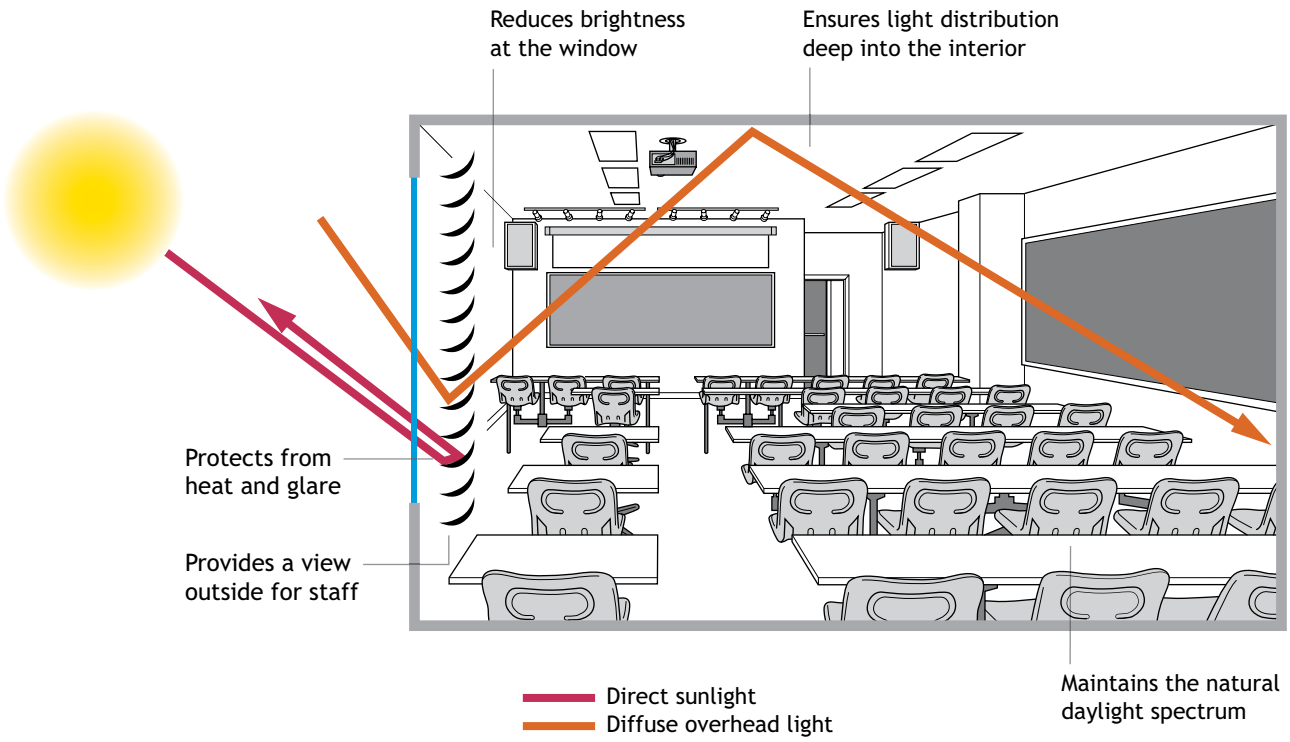
Avoid blinds down and lights on

A familiar scene in office and study areas is the use of blinds to control daylight glare from outside, with the task lighting switched on. Where possible, encourage staff to use blinds to direct daylight onto the ceiling and walls instead. This is shown in Figure 4 below.

Reflecting the outside light in this way can reduce the need for electric lighting as well as reducing the glare caused by direct sunlight. Once the sun moves away, open the blinds rather than leaving lights on.

Many daylight blinds also have perforated blades to enable a view outside, which can make rooms more pleasant.

Figure 4 *Using blinds to reflect daylight*



Maintenance

Keep windows, skylights and light fittings clean. Failing lamps should be reported by staff and replaced in order to maintain the desired light output. Regularly replace old, dim lamps and keep controls in good working order by ensuring timers are set correctly and that any occupancy sensors are clean. Without regular maintenance, light levels can fall by 30% in 2-3 years.

Install low-energy lighting

Upgrade any 'standard' tungsten light bulbs to energy saving, compact fluorescent lamps (CFLs) which use 75% less energy, produce less unwanted heat and last 8-10 times longer.

Replace blackened, flickering, dim or failed fluorescent tubes with triphosphor coated ones (this is stated on the packaging). Triphosphor 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.

Specify high frequency fluorescent lighting systems and mirror reflectors whenever fluorescent lighting is to be replaced. This should be included in the university or college's purchasing policy. High frequency tubes reduce energy use and heat output, eliminate flicker and hum, extend lamp life (by up to 50%) and can allow dimming — all of which can make a learning environment more comfortable.

Always consult a qualified lighting technician before upgrading lighting systems and specify lighting that appears on the 'Energy Technology List' (www.eca.gov.uk/energy) to ensure it is efficient. Contact the Carbon Trust to find out more.

REMEMBER:

Artificial lighting should only be used to supplement natural daylight so effective lighting systems should respond to daylight levels accordingly.

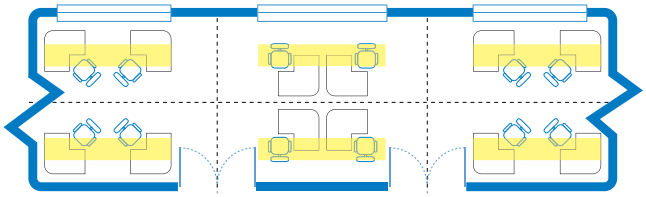
Consider controls and sensing technology

Suitable lighting controls for FHE establishments include time switches with a manual override for teaching areas and occupancy sensors in intermittently occupied spaces. If these are used in sports halls, an override must be provided for quiet activities such as examinations as controls should not disrupt educational activity. Lighting controls should also take into account community use of the building and the requirements of cleaners and security staff.

Switching in parallel

Consider wiring light switches to control lights that are parallel to windows. This enables occupants to make the most of natural daylight without leaving those spaces further away from the windows in shadow. As a result, less lighting is used which reduces energy consumption and also cuts down on additional heat generated by the lights, which means that less cooling is required. Figure 5 below demonstrates this.

Figure 5 *Positioning lights parallel with windows*



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

REALITY — Fluorescent tubes use only a few seconds worth of power in start-up — therefore, energy is always saved by switching them off when leaving a room.

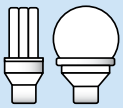
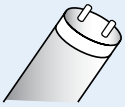
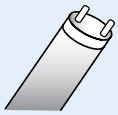
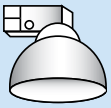
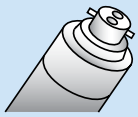
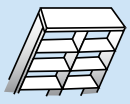
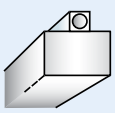
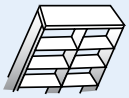
How to spot different types of lighting

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

More information is given in the Carbon Trust's technology overview of *Lighting* (CTV021).

top tip:

Consider installing sub-meters in order to gain exact information on lighting costs. See page 24 for more information.

Existing lamp type	Uses	Energy efficient option	Energy saving/ benefits	Application notes
 Tungsten light bulbs	General lighting and task lighting. Also commonly used in domestic applications	 Replace with compact fluorescent lamps (CFLs) in the same fitting	75% saving plus longer lamp life	General lighting – attractive modern CFL replacements may also be acceptable for display and feature lighting
 38mm (T12) fluorescent tubes in switch-start fittings	General lighting commonly used in lecture halls, teaching rooms, workshops, office spaces	 Replace with equivalent 26mm (T8) triphosphor fluorescent tubes of lower wattage	8% saving plus longer lamp life	General lighting throughout FHE buildings, but even better used with modern fittings (see below)
 High-wattage filament lamps or tungsten halogen lamps as used in floodlights	Commonly used to light external areas, ornamental features and building facades	 Replace with metal halide or high wattage compact fluorescent lighting	65-75% saving plus longer lamp life	Flood lighting, external lighting and some general lighting situations
 Mains voltage reflector lamps, filament spot and flood types	Commonly used for spot lighting and display lighting in areas that require bright light and good colour rendering. Commonly found in reception areas and public areas	 Replace with low-voltage tungsten halogen lighting or metal halide discharge lighting	30-80% saving for equivalent lighting performance	If low voltage tungsten halogen spotlights are installed there is a further saving using 35W infrared coated (IRC) bulbs instead of the standard 50W bulbs
 Fluorescent fittings with the old 2ft 40W, and 8ft 125W fluorescent lamps	General lighting, commonly used in teaching rooms, computer facilities, lecture halls, and offices	 Replace with efficient fittings using reflectors/ louvres or efficient prismatic controllers with high-frequency electronic or low-loss control gear and triphosphor lamps	30-45% saving with much improved lighting quality. The use of high frequency electronic control gear eliminates flicker, hum and stroboscopic effect	Reduction in flicker and hum can assist learning by removing distractions
 Fluorescent fittings with opal diffusers or prismatic controllers which are permanently discoloured	General lighting, commonly found in older buildings requiring refurbishment such as lecture halls and in areas such as corridors and building entrances	 Replace with new prismatic controllers or replace complete fittings as above	No reduction in energy consumption but increases the amount of light by between 30% and 60%	General lighting levels can be improved leading to a more attractive and conducive learning environment

To order *Lighting* (CTV021), contact the Carbon Trust (details can be found inside the back cover).

Office and laboratory equipment

The growth of IT equipment in the FHE sector accounts for a significant proportion of electricity bills. Science and laboratory equipment also add considerable costs and are often some of the highest individual energy users in a college or university.

Office equipment

Turn off and power down

Switch off all equipment when not in use and enable power down modes to reduce energy consumption and heat production. This will also reduce the risk of overheating in a space, therefore improving occupant comfort. Equipment should last longer which could mean lower maintenance costs and fewer breakdowns.

Install plug-in seven-day timers

These only cost a few pounds from most DIY stores but reduce the likelihood of machines being left on out of hours. They are best fitted to communal equipment such as photocopiers, printers, vending machines and fume cupboards that can be switched off when not in use. Check with your equipment supplier first about any service agreements that may be affected.

Use the most efficient settings

In FHE establishments, office equipment is constantly in use by a steady stream of staff and students. It is therefore important to ensure that energy saving modes are activated on all apparatus where possible in order to minimise consumption and costs.

Set default printing to double-sided (duplex) and try to print in batches to allow the machine to spend more time in standby than idling mode. Take care though; machines with a very deep sleep mode can take longer to reach the right temperature, frustrating users and increasing the risk of the feature being disabled.

Reduce cooling loads

Place heat emitting equipment such as printers and photocopiers in a separate, naturally-ventilated area with good airflow. This helps to prevent overheating and it also removes potential emissions from equipment as well as reducing noise. Colder areas on the north side of buildings are ideal.

Maintain equipment

Printers, copiers and laboratory equipment such as fume cupboards should be checked and cleaned at least every quarter. Keep parts and any filters clean and free of dust. Follow manufacturers' advice on servicing schedules in order to maintain optimum efficiency.

Consider upgrading existing computers

Some computers can simply be upgraded with newer, more energy efficient components so look into this option before purchasing new machines. Flat screen (LCD) monitors can reduce monitor energy use by over two thirds. There are also obvious space advantages.

Purchase for your requirements

Choose equipment that meets current and predicted requirements. Do not over-specify — computers with large screens and fast processors use more energy and may not be necessary. Always take running costs into account.

Ensure all new equipment has energy saving features meeting at least ENERGY STAR performance specifications. See the Carbon Trust's *Office equipment* technology overview (CTV005) for further information.

fact:

A computer left on 24/7 will cost around £37 a year. If switched off at night and at weekends, this can be reduced to around £10 a year and save the equivalent amount of energy required to make more than 30,000 cups of coffee.

top tip:

Check settings regularly, particularly at the beginning and end of term, as usage patterns may change.

To order *Office equipment* (CTV005), contact the Carbon Trust (details can be found inside the back cover).

Laboratories and studios

Many FHE laboratories and studios operate appliances with high power consumption. Usage of such equipment should be strictly monitored to ensure energy consumption and costs are minimised as much as possible.

Science equipment

Usually, equipment is provided by a technician at the start of the lesson and left on until the session ends. In busy science labs and studios, there is a danger that equipment will be left on all day — and even overnight.

Assign responsibility for switching off equipment to specific students at the end of each session. Remember though, that it may be impractical to turn off some measurement equipment for which the accuracy is affected by insufficient 'warm-up' times. Label these clearly and provide full switch-off instructions for each piece of equipment.

Fume cupboards

Energy use associated with fume cupboards can be significantly reduced through careful consideration of incoming (make up) and extract air systems and by selecting equipment with the ability to vary the extract air rate to meet requirements.

- Use the right sash height — an inappropriate sash height can increase energy use as well as putting users at risk from the ineffective extraction of fumes
- Avoid using the fume cupboard as bench space — use it for stages of the experiment that present a hazard rather than for the entire operation
- Avoid using fume cupboards to store chemicals — use a dedicated storage cupboard instead.

Kilns

Energy use associated with kilns can be reduced by making sure they are fully loaded before firing and running several batches together. Consider whether they can be fired overnight or at weekends to reduce the institute's maximum electrical demand.

Make sure that kilns are cleaned as set out in the manufacturer's instructions or they will fail to perform efficiently.

Other small power equipment

Other equipment used in art and craft studios will have very small power loads but this can become substantial when multiplied by the number of students using it. For example, soldering irons heat up fairly quickly, so encourage students and staff to turn them off when not in use.

fact:

Fume cupboards operate at 'negative pressure', meaning that they draw air in from the room in which they are housed and out via dedicated extraction systems. Their energy costs are significantly greater than the fan power alone and an individual cupboard can cost as much as £750 a year due to the additional heating required to heat incoming replacement air.

Leisure facilities

There are simple ways to save energy in this increasingly popular resource.

Leisure facilities are becoming common additions to universities and colleges, providing for the needs of staff, students and more widely, the local community. However, the demand for gym equipment on FHE sites has increased electrical consumption — greater usage and volume of fitness equipment that is often situated in separate air-conditioned rooms is largely responsible. Many site managers do not realise that there are a number of simple ways to minimise energy consumption in these areas whilst still maintaining the same level of service.

Swimming pools

Heated swimming pools are major users of energy. In fact, up to 65% of the energy used in a leisure facility will be used for pool heating and ventilation. Looking at the way energy is managed can provide substantial savings. Also, knowing how much a swimming pool is costing can help make the case for any investment required to reduce these costs.

Maintain comfortable pool temperatures

Swimming pool water is usually heated to 28-30°C. To reduce condensation, air temperature should be 1°C above the water temperature. These relatively high temperatures will result in high heat losses from the pool hall which need to be replaced. In addition, high ventilation rates are necessary to protect the pool hall structure from condensation, further increasing the amount of heat lost.

Closely regulate water and air temperatures and control ventilation using variable speed fans. 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%.

! Seek expert advice

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

Use a pool cover

Swimming pools may only be used for a few hours a day yet maintain 24-hour heating and ventilation regimes that are only required when the pool is occupied. Using a pool cover when the pool is not occupied can produce savings of tens of thousands of pounds through reducing the need for heating (water and pool hall air), pool hall ventilation and make-up water.

Case studies have shown that where a full cover is fitted, ventilation has been switched off at night without any condensation problems occurring. It 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 3 years.

Schedule backwashes

To work efficiently, swimming pool filters need to be cleaned by backwashing all of the captured matter out of the filter. Backwashing is very costly in both water and energy terms so any reductions in this area will lead to significant savings. An effective backwashing system is one that only removes sufficient water from the pool to meet health and safety standards. The interval between backwashes will depend on the type of pool and the degree of usage. Cyclic (for example, weekly) 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. In some cases, heat from backwash water can be used to heat new pool water through heat exchangers — this can provide worthwhile savings. Contact the Carbon Trust to find out more.

FHEs with extensive leisure facilities should also refer to the Carbon Trust's sector overview *Sports and leisure* (CTV006) (details can be found inside the back cover).

> 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

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.

Use heat recovery of ventilation air

It is possible to recover heat from the pool air that would normally be lost by means of heat recovery. This heat can then be used to preheat incoming fresh air. There are many cost effective technologies available but getting it wrong could have health and safety implications, so always seek professional help.

Combined heat and power (CHP) and district heating networks

A swimming pool has a year-round heat requirement which can make CHP a viable option for FHE buildings. Connecting such facilities to an existing CHP or district heating network could make the system more cost effective. See page 25 for further information or contact the Carbon Trust.

Fitness areas and gyms

Fitness equipment is used sporadically throughout the day. At quieter times of day, ensure some machines and gym equipment are switched off to save on energy and costs. Where possible, switch apparatus off at night along with comfort cooling.

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.

top tip:

Turn off heating in saunas and steam rooms when not in use, as the electric heating in these facilities is expensive to run.

Catering

Water and energy usage in FHE canteens and refectories are areas that can offer cost savings without compromising hygiene or resources. Managing energy use can often have the additional benefits of improving the quality of the food produced and a better working environment for kitchen staff.

Raise awareness amongst kitchen staff

The following actions are very simple, but could save up to 25% of kitchen energy use.

- Do not switch on too soon — most modern catering equipment reaches optimum temperature quickly. Label equipment with its preheat time and educate staff to switch on only when required
- Avoid using kitchen equipment to warm the space on staff arrival — the building's heating system should do this effectively. If it does not, find out why
- Switch off grills, fryers and hobs immediately after use
- Avoid overfilling saucepans and kettles and use lids where possible
- Keep fridge and freezer doors closed and defrost regularly to save energy and prolong equipment lifetime
- Switch off equipment, lights and extraction fans when they are not being used
- Reduce drying times on dishwashers by allowing residual heat to finish the drying process
- Move fridges and freezers out of kitchen areas into well ventilated, uncooled spaces
- Avoid using open boiling water steriliser systems as these are dangerous and wasteful
- Boil water in a kettle, rather than on the hob in order to avoid wasting heat.

Purchase equipment with running costs in mind

Although gas-fired equipment may be more expensive to buy than electrical or steam equivalents, savings made on running costs make it a more efficient option.

Purchasing thoughtfully can save a great deal. For example, equipment that automatically switches off, such as pan sensors on hobs, can save 25% on energy costs. Select ovens with large double-glazed viewing windows to reduce the need to open doors to inspect contents.

Sub-metering

Sub-meters will help identify cost savings and justify any investments required in order to lower running costs. If catering is provided by a separate company, there is also the additional benefit of allowing for budget allocation and charging to take place. This acts as an incentive for kitchen managers to reduce energy costs by providing some financial reward for doing so. For more information about sub-metering and energy management, see page 24.

Consider heat recovery

Large volumes of warm air are expelled from kitchens. Many kitchen managers do not realise that over 50% of this heat can be recovered using heat recovery devices which can significantly reduce energy costs. An air-to-water recovery device is often the most effective method of recovering heat because it can then preheat hot water, providing a year-round use for the recovered heat. Contact the Carbon Trust to find out more.

For more information about saving energy in catering facilities, contact the Carbon Trust (details can be found inside the back cover).

Cookers

Improving the management and use of ovens results in savings — so think carefully about how and when food is cooked. There may be opportunities to use the cooker for less time, or not at all. For example, microwave ovens are quicker and use less energy, so they may be an option in some cases.

When buying new cookers, consider induction cookers and those with halogen hobs — these heat up and cool down faster than conventional hobs.

Buying new appliances

When buying new appliances, choose the most energy efficient model within your price range. All domestic sized cookers, fridges and freezers have an energy rating which indicates their efficiency; an A or A+ rating is the best and a G rating is the worst. Some appliances may also have a separate Energy Efficiency Recommended label. This is found on products that have been carefully selected for their energy efficiency.

Refrigerators

As refrigerators and freezers are on 24 hours a day, seven days a week, a regular maintenance check (which includes an energy check) is recommended to maintain optimum performance. It is also advisable to consider the following tips in order to minimise energy consumption and costs:

- Position fridges/freezers away from heat sources (such as cookers)
- Set the thermostat at the right level for the fridge's contents. You may need to adjust settings when the fridge is empty. Note that freezers operate more efficiently when full
- Check the seals are intact
- Encourage staff and students not to open doors unnecessarily
- Defrost regularly
- During the holidays, clean fridges, turn them off and leave them open where appropriate. If this is not possible, consider putting all perishables into one or a small number of cabinets, and switch off the remainder.

CASE STUDY

Bristol University

Image courtesy of Bristol University.

First opened as University College, Bristol in 1876, Bristol became a full university in 1909. It currently houses 45 departments and 15 research centres in 377 buildings. Bristol University's energy bill is in the region of £7 million per year. It uses 130 MWh of energy annually, emitting 41,000 tonnes of carbon dioxide.

The university has been working with the Carbon Trust for three years to increase energy efficiency and reduce carbon emissions through strategic projects. In that time, potential reductions of more than 10,500 tonnes of carbon dioxide, or approximately 27 per cent of emissions have been identified. Efficiency measures include:

- Purchasing and implementation policies to increase the efficiency of lighting across all properties
- Implementing strategies to improve controls on the heating, ventilation and air conditioning (HVAC) system and developing low-energy cooling solutions
- Finding technical solutions to meet refrigeration needs more efficiently and engaging with relevant staff
- Optimising the Building Energy Management System across all buildings
- Raising awareness of energy efficiency across lighting, HVAC and refrigeration through staff training.

Good housekeeping / people solutions

Many good housekeeping measures are simple to implement in FHE establishments and need not require any initial outlay.

Most opportunities are within the control of staff and students, which is an ideal way of involving people and raising awareness of the importance of reducing energy consumption. Good energy management helps to achieve:

- Environmental benefits
- Healthier and more productive working conditions
- Cost savings
- Improved social and environmental credentials, which can be promoted to prospective students and funding bodies.

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. Appoint 'energy champions' across the site, preferably in each department, to turn off unnecessary equipment and carry out inspections of lighting and equipment use. Findings should be reported at regular meetings so that progress can be measured.

Get everyone involved

As everyone on-site has an impact on energy use, it should be everyone's responsibility to use energy wisely. Appoint an energy team comprising management, teaching staff, cleaners, maintenance staff and some student representatives to help identify opportunities for savings.

- Encourage cleaning staff to report any faulty lamps and to only use lighting where it is required
- Invite students to report areas that are overheated, where doors and windows are not closing properly, or where lighting or equipment is being left on unnecessarily
- Ask maintenance staff to monitor and adjust control settings to meet but not exceed internal requirements for heating
- Request laboratory technicians to check equipment is switched off at the end of the day
- Ask managers or administrators to investigate current and past energy use and to continue to monitor energy consumption.

Undertake regular housekeeping walk rounds

It is a good idea to walk round the campus and identify what energy using equipment exists, where it is situated and how it is used. *Assessing the energy use in your building* (CTL003) explains how to conduct an energy walk round and the key points to look out for — contact the Carbon Trust to find out more.

Note down and act on any maintenance measures identified from walk rounds in order to avoid expensive problems later on. Try walking round the site during teaching periods and after hours to see how energy is used and whether there are any obvious savings available. 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 staff and students in the process, which can help to develop a sense of ownership amongst participants.

top tip:

Raise awareness

Are there any environmental groups at your college or university? Approach them about running an awareness campaign in conjunction with management staff. Demonstrating a visible commitment to energy efficiency will help to enforce the message across the whole campus. The Carbon Trust's publication *Creating an awareness campaign* (CTG001) has guidance on planning a successful campaign and a selection of resources.

To order a copy of *Assessing the energy use in your building* (CTL003) contact the Carbon Trust (details can be found inside the back cover).

Record and understand energy consumption

Take regular meter readings so any changes in energy use can be quickly identified and followed up. Compare these figures to other similar sites to highlight excessive consumption. Remember, a site with a swimming pool or residential accommodation would be expected to have higher energy bills than one without. However, two sites with similar facilities should have comparable energy use.

Review energy invoices and meter readings over time. Most larger sites will have (or would qualify for) half-hourly meter reading for their electricity. If this is not already available, speak to the electricity supplier about providing it.

DID YOU KNOW?

Using appropriate sub-meters allows visibility not just of the use of energy, but the time that energy is consumed. This can then be used to more accurately re-charge departments in line with energy supply contracts.

Meter separate departments

Installing sub-meters in each department and re-charging them for energy used can be a great motivator to reduce costs. If meter readings are taken at regular half-hourly intervals when a building is occupied and at the beginning and end of the day, it will be possible to identify how the energy is used over the course of a week. This information could be used to help make the case for any investment required to reduce these costs.

First, install sub-meters in key areas such as kitchens, leisure facilities, residential halls and science labs etc to find out how energy is used and then set budgets for each. Discuss these with department heads to manage any resistance and ensure that staff members are involved from the outset. As an incentive, money saved could be made available to spend by the department itself. Budgets should be assessed and reduced across the board so as not to penalise and de-motivate those departments that are making good progress.

CASE STUDY

What other institutions are doing: Warwick University

Image courtesy of Warwick University.

With an annual energy bill of more than £4 million and annual carbon emissions of more than 38,000 tonnes, Warwick University decided to look at ways to improve its energy efficiency. By working with the Carbon Trust, the university has now identified ways to reduce carbon emissions by 10% and save up to £1 million in energy costs over five years (based on 2004-5 levels). To reach these targets, a number of key actions were identified to address its energy use and spend.

These include:

- Installing energy efficient light bulbs along with lighting and heating controls
- Implementing energy awareness campaigns and competitions targeting staff and students; these include one offering a hot air balloon ride for the winners
- Using biofuels where appropriate
- Purchasing three new electric vehicles, through which the university expects to save £4,000 per annum on fuel and approximately ten tonnes per annum of carbon dioxide
- Introducing recycling schemes within halls of residence thereby reducing overall waste costs by 10%
- Investigating the use of small wind turbines.

An Environment Officer and a Waste Consultant have been appointed to oversee the programme and the implementation plan has been integrated into the overall business plan. During this financial year, the university is set to cut its carbon emissions by more than 4,000 tonnes.

Combined heat and power (CHP)

CHP can offer an economical method of providing heat and power which is less environmentally harmful than conventional methods.

Combined heat and power (CHP) is the simultaneous generation of heat and power in a single process. CHP equipment usually burns fossil fuel such as natural gas or diesel oil to generate electricity on-site. At a power station, the heat generated when electricity is produced has to be dissipated via cooling towers. With CHP, the heat is recovered on-site, and used for space-heating, domestic hot water, or heating a swimming pool. This means that overall, the process is more efficient, so less fuel is used.

Generally, CHP can be applied to any FHE building or site, provided it has a significant, year-round demand for heat. A university with a swimming pool would be a good candidate for CHP.

However, not all sites are suitable for CHP, nor will they all have a good payback. Make sure that the site is investigated properly, including a complete financial and technical appraisal from an expert.

In an appropriate application, CHP can reduce energy bills by around 20-30%, provided the unit is designed to meet the building's seasonal demands for electricity and heating. Even better, good quality CHP qualifies for Enhanced Capital Allowances and the fuel input is exempt from the climate change levy (CCL). Contact the Carbon Trust for more information.

Information for sites without CHP installed

When to consider CHP installation

The best time to consider CHP in existing buildings is when the heating plant is being replaced, so that the CHP unit can be integrated with the heating system. The commercial value of the electricity and heat produced by a CHP unit is greater than the combined cost of the fuel consumed and the maintenance for the system.

Undertake an initial feasibility study

When considering CHP, it is important to carefully assess its application and feasibility based on existing heat and electricity loads. Space requirements should be considered, along with a detailed evaluation of the system's engineering, economics, reliability and operation. To justify the cost of investment, the aim should be to maximise the use of all the heat and hot water that the system can produce. Every building is different and therefore a detailed cost calculation is essential. This assessment should be made only after other more simple energy efficiency measures outlined in this guide have been implemented.

Consultancy support may be available from the Carbon Trust to help with evaluating the feasibility of CHP on an FHE site.

Consider exporting heat via a community heating system

If there is not sufficient heat demand in the area, CHP may still be feasible if there is a close off-site heat demand, for example, a nearby industrial company with a demand for heat that could allow the excess heat to be sold on.

Investigate funding opportunities

If budgets cannot stretch to investing in CHP, explore options for third party funding. Energy services and contract energy management options absorb the initial cost and risks associated with installation, maintenance and operation of a CHP unit. Charging arrangements vary but under certain contracts, a university may only pay for fuel used by the CHP unit and receive the heat for free as well as paying a reduced price for electricity.

Information for sites with CHP installed

Maintenance issues

CHP systems require regular maintenance to ensure efficient operation and reduce the risk of breakdown. Major maintenance should be carried out as part of a planned shutdown. When deciding on the timing and duration of a shutdown, always consider cost implications such as for labour and materials required to carry out the planned work as well as additional costs of meeting the site's heat and power requirements from other sources. For smaller installations, shutdowns are normally undertaken by the CHP supplier who also maintains the unit.

Monitor to ensure system performance is as designed

A CHP system should be monitored to ensure it is operating correctly. Look out for factors that affect performance such as changes in output and fuel consumption, air temperature and pressure in gas turbine installations. It is also important to monitor the rate that system performance changes as this provides a basis for planning maintenance tasks and plant overhauls. Always explore why performance is failing to meet the specification as this could indicate maintenance requirements. It will also be reducing the cost effectiveness of the system.

Avoid paying the climate change levy (CCL)

Monitoring data collected can be used to demonstrate compliance with the necessary CHPQA quality standards for exemption from the CCL. Metering installed for CCL registration must be able to differentiate between heat used by the site and heat rejected to atmosphere via a cooling system, so ensure meters are positioned correctly to achieve this.

Exemption from the CCL for Good Quality CHP is based on certificates issued by the Government CHPQA programme. Details of monitoring requirements for the CHPQA programme are available at **www.chpqa.com**

Action checklist

Action	Progress
Set temperature controls to suit the space and only have heating on when needed	
Minimise heat wastage by closing doors and keeping radiators unobstructed	
Maintain boilers and pipework for optimal working	
Revise control options — consider optimum start, compensators and TRVs	
Fit water-saving devices	
Make the most of natural ventilation and cooling	
Check that heating and cooling are not operating at the same time	
Switch off all non-essential lights	
Investigate and install the most efficient lighting options	
Install controls — consider time switches, occupancy sensors and daylight sensors	
Turn off unused electrical and office equipment. Pay particular attention to big energy users, such as fume cupboards and kilns	
Consider life-cycle costs when purchasing equipment	
Check pool temperatures and invest in a pool cover	
Make sure fitness equipment is off when not needed	
Protect against heat loss through the building fabric of floors, walls, roofs and windows	
Repair gaps immediately so heated or cooled air is not escaping	
Target catering facilities, particularly bad habits regarding cookers and refrigerator cabinets	
Get all staff involved — write an energy policy and run an awareness campaign	
Monitor energy usage by checking meter data and bills	
Consider sub-metering to get a picture of different departments' energy usage	
Set targets and devise an action plan	
Consider CHP after a detailed feasibility study. Ensure any CHP plant is adequately maintained	

Contact the Carbon Trust for further guidance and support on improving energy use.

Next steps

Improve the energy performance of the FHE establishment.

Step 1. Understand your energy use

Look at your site and identify the major areas of energy consumption along with those buildings that are not performing as well as the rest of the site.

Consider setting departmental budgets and devolving these to the department through a re-charge process.

Step 2. Identify your 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. Compare different buildings to determine how they are performing in relation to each other. An example checklist is available in *Assessing the energy use in your building* (CTL003), available 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. Where funding is limited, focus on energy intensive areas or those that are performing badly first – especially where there is little or no capital expenditure.

Step 4. Seek specialist help

It may be possible to implement some energy saving measures in-house but others may require specialist assistance. 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 energy priorities.

Ring-fencing an energy management budget for efficiency investments could ensure limited funding is available for specific projects. Savings from investment could be fed back into the budget to provide a revolving fund.

Step 6. Continue to manage your site's energy use

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

Related publications

The following publications are available from the Carbon Trust:

Sector overviews
Office based companies (CTV007)
Sports and leisure (CTV006)

Technology overviews
Building fabric (CTV014)
HVAC (CTV003)
Office equipment (CTV005)
Refrigeration (CTV002)

Technology guides
Creating an awareness campaign (CTG001)
Heating control (CTG002)

Online resources

The Higher Education (HE) Network

The HE Network is an online community for Higher Education energy officers who have an interest in non-domestic energy and environmental issues. The HE Network is funded by the Carbon Trust.

Visit **henetwork.carbontrust.co.uk** to apply for free membership.

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.

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CARBON TRUST

Making business sense of climate change

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

An independent company set up by the Government to help the UK meet its climate change obligations through business-focused solutions to carbon emission reduction, the Carbon Trust is grant funded by the Department for Environment, Food and Rural Affairs, the Department of Trade and Industry, the Scottish Executive, the Welsh Assembly Government and Invest Northern Ireland.

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