Managing energy use in your community building

toe2 Trust for Oxfordshire's Environment

Putting people and places together

OXFORD BROOKES UNIVERSITY

Why Energy Efficiency?

This guide has âen prepared by Moira Dorey and Michael Esvelt of EiE at Oxford Brookes University. The information in this Guide comes as a result of knowledge gained from auditing over 120 Oxfordshire community buildings ranging from village halls to sports pavilions and churches. It has âen supported by the Trust for Oxfordshire's Environment (TOE2) with funding from the Patsy Wood Trust.

Community buildings provide services to the whole of the local community from the elderly to young children. They contribute to community cohesion and often support the most vulnerable people within society. A well-used community building provides facilities for a multitude of community uses ranging from easily accessible keep-fit classes to an affordable wedding venue. However, the varying requirements of the different user groups provide a challenge for energy management.

The standard of heating, insulation and even lighting within these buildings has often remained at the same level as when the building was originally constructed while the users' expectations are increasing. Cold and unwelcoming buildings quickly lead to decreasing usage, less revenue and a cycle of disrepair.

In contrast an energy efficient building, which is well insulated, properly heated, with good lighting and facilities will stand out as an inviting community space.

By careful management of the energy used in the building, expenditure will be controlled and hire charges can remain competitive for the whole community, ensuring that the building flourishes as a valuable communal resource.

Additionally, an energy efficient building, using the latest technologies and good practices, can also be a showcase to households in the community for how they can adopt these technologies and best adapt their behaviour to save energy and reduce fuel bills in their own homes.

Contents

The efficient use of energy

Community buildings benefit from energy consuming technology to offer a wide range of services for diverse users. For example a film night showing the latest film streamed through an online rental service in a warm hall where cold beer is served in clean glasses from the dishwasher owes its success to energy consuming technology! Energy efficiency is not about living in austerity, without the use of electricity, gas and oil. Energy efficiency is about the sensible use of these resources, managing your systems and procedures so that your users are provided with a comfortable building where energy use is controlled both for cost and carbon reduction.

About this Guide

This Guide is designed to assist you in making decisions that will support energy efficiency. Each chapter covers a different energy use topic and includes an Assessment Check and options to consider in changes to systems, controls and management. The final section will deal with user interaction and making users more aware of good energy efficiency practice.

If you want to explore a topic further there is a technical section to support this at the back of the Guide. Throughout the Guide you will find case studies from community buildings across Oxfordshire which have already taken action to improve their energy efficiency.

The five topic areas that will â covered are:

Insulation - improving insulation standards in roof spaces and ceilings, walls, floors, doors and windows

Heating - improving the operating efficiency of heating systems

Hot Water - reducing the energy used to provide hot water

Lighting - reducing the electricity used to provide internal and external lighting

Renewable Energy - options for the installation of renewable energy technologies

Why would you consider energy efficiency?

- To reduce running costs
- To make the building financially independent
- To improve the facilities for current users
- To encourage use from other local groups and individuals
- To encourage use from outside the immediate community
- To reduce the carbon footprint of your building

Insulation

"No one seems to know when the building was constructed or how much insulation we have"

Keeping the heat inside your building is one of the best ways to conserve energy used in heating. Improving insulation and draught proofing is a challenge in older community buildings that often have high, open ceilings, single brick walls, or single glazed windows. Newer buildings are generally better insulated as planning regulations require minimum levels, but this does not always mean there is no room for improvement. While insulation measures can be more expensive and disruptive than other energy efficiency actions, improvements will result in a warmer, more welcoming hall that is more energy efficient.

"I can't imagine how much we're heating the outdoors around our community hall!"

"On sunny days you can see the light coming in from around the doors"

How does insulation save energy?

Imagine a south facing building with no insulation. Heat will be lost rapidly through that roof in winter and the sun will heat the roof and overheat the building in summer. Good insulation slows the rate of thermal transfer, effectively reducing the energy needed to maintain the internal temperature.

INSULATION ASSESSMENT CHECK

Assess the insulation and airtightness of your community building by ticking the statements that apply.

- ☐ Our heating costs are felt to be quite high
- ☐ Our building feels cold even when heating has been on for a number of hours
- ☐ Our building cools down very quickly after the heating has gone off
- ☐ Our building is more than twenty years old and insulation has never undergone major refurbishment or upgrade
- ☐ There is no insulation in the loft space above the ceiling
- ☐ There is a loft space above the ceiling, but not much is known about it
- ☐ Our building may have cavity walls that could be filled, but this has never been checked
- ☐ Walls are a single brick or less in thickness
- ☐ Windows are single glazed
- ☐ There are visible gaps around external doors
- ☐ Building users complain of draughts inside the building

0 ticks	Your building appears to be well insulated and keep the heat in - well done!
1 to 5 ticks	Some actions may improve insulation and draught proofing.
6 to 11 ticks	A number of improvements to insulation and / or draught proofing can reduce energy use and increase comfort in the building.

U-values

UK Building Regulations set levels of thermal insulation required when constructing a new build, building an extension, or refurbishment projects. Levels are expressed as a U-value of thermal transmittance which needs to be achieved; the required U-value will depend on the location of the project (England, Scotland, Wales), type of building (domestic, non-domestic) and the application (floor, wall, roof). The U-value, expressed as W/m^2 is simply a measure of the flow of heat through an insulating or building material: the lower the U-value, the better the insulating ability.

Identifying Opportunities

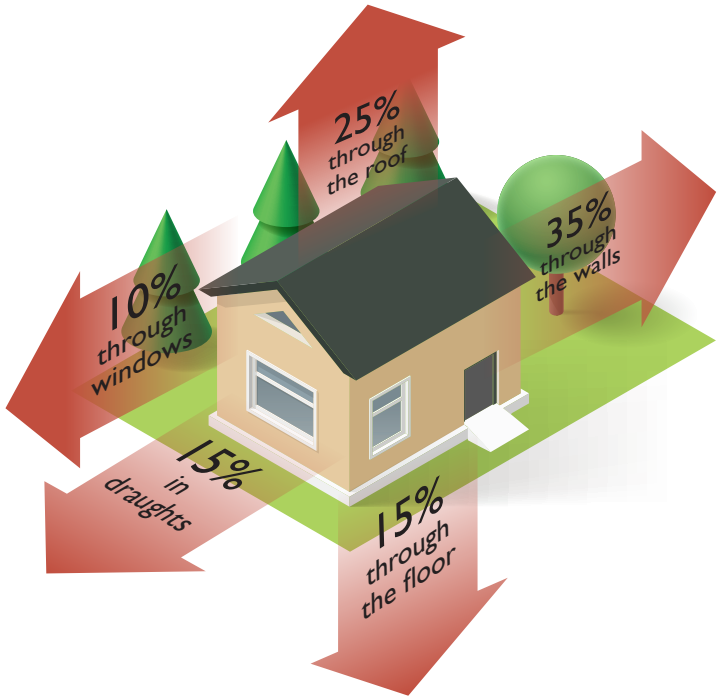
Insulation and draught proofing is very much a physical system; it is either present or absent, it has no settings. However, users can control windows, doors, and even interact with insulation to reduce its effectiveness. The better the insulation the less energy is needed to heat a space. Also, the more airtight a building is, the less draughts will reduce the effectiveness of heating. If insulation and draught proofing in your community building falls into the orange or red results section of the assessment, the following suggestions might help you to reduce energy use from heating.

Note: the end notes ('I') are provided in the Insulation Appendix at the end of this guide.

System

If current levels of insulation are not known, an inspection can be carried out by a professional to help prioritise areas where insulation improvements will have the largest savings.

If levels of loft insulation are known to be 100mm or below, increase insulation to the current recommended minimum of 270mm or more. Insulation levels in excess of 300mm may only be cost effective in buildings with high demand for heating.



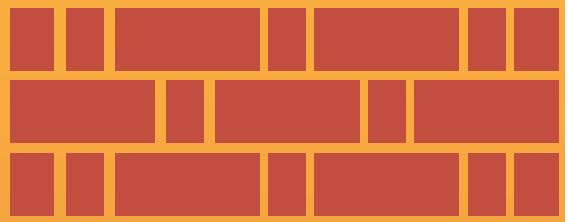
- If your loft is boarded out and used for storage there are a number of options for adding insulation. Either remove the boards and build up the rafters using wooden blocks or loft legs before adding insulation and returning the boards or add insulation-backed boards on top of the existing floor. Avoid compressing mineral wool insulation as this will reduce its effectiveness.
- If roof insulation has been cut around light fittings to avoid them overheating, fixtures are now available that will fit on top of the lights to mitigate this insulation issue[11].
- If a pitched roof has no or minimal loft space, the ideal time to insulate is when the roof is being replaced as access becomes easier. Alternatively, consider adding insulation internally to the pitched roof. Considerations for retaining desirable features such as exposed wooden beams may need to be made, however, there are a range of suitable insulation products including thin internal insulation panels. For hard to access spaces sprayed insulation solutions can be applied.
- If windows are single glazed or particularly old, consider replacing them with double glazed units or adding secondary glazing. Both are expensive projects and the payback period on initial costs needs to be considered as often there are other insulation priorities. A cheaper short term alternative to keep out winter draughts might be clear internal window covers[12].
- If the building has a flat roof, insulation can be improved by adding internal ceiling panels (if space allows) or external insulation. External insulation is expensive but should be added when the roof is being refurbished.

Alternatives to mineral wool

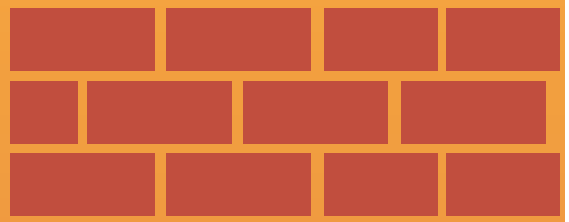
There are a number of natural alternatives to mineral wool insulation available on the market. These include sheep's wool and sheep's wool blends, hemp and a variety of recycled products. While these options are a little more expensive they may be kinder to the environment and less harmful to your volunteer installers!

Cavity walls

Wall cavities may be present in buildings constructed from the 1920s onwards. Buildings constructed from the 1990s onwards are likely to have filled cavity walls. However, it is worth getting a specialist to check that the insulation has not degraded. An easy way to tell if your building has cavity walls is to check the brickwork on the outside.



Flemish bond brickwork pattern indicating solid wall



Stretch bond brickwork pattern indicating a cavity wall

Cavities can be filled with insulation in a number of ways including mineral wool, foam or loose pellet. New builds may use insulation boards. There are potential issues with moisture to consider, therefore consult only qualified contractors when assessing and installing insulation for wall cavities.

- If walls are single brick or breeze block, or another material with poor insulation properties, insulation can be added on the inside of the wall, reducing internal space, or to the exterior of the building. Exterior wall insulation is more expensive than interior wall insulation.
- If your flooring is being replaced, building regulations will require you to insulate under the floor where possible. It is not normally sensible to insulate under your floor unless you are taking the floor up to replace it anyway.
- If you have poorly fitting external doors, or doors to unheated areas of the building, add a door brush or draught strips to reduce draughts. Only in extreme cases, where the door is warped or damaged, will it need to be replaced.
- If you have poorly insulated windows that let out the heat, a cheaper alternative is adding good quality insulated curtains to retain the heat in your building. The building committee may know a community volunteer who can make them.

High or low ceiling?

Some community buildings wish to retain a high ceiling while others are happy to install a flat ceiling. Both options allow for different insulation solutions, but with well-chosen insulation and good heating management, both options can be managed to improve energy efficiency.

Management Actions

If you find users leaving doors open, install automatic door closers or post signage near or on the doors reminding users to close them.

If you find users opening windows and doors for ventilation when the heating is on, request that they notify a committee member so that the thermostat can be adjusted. Alternatively, if users have control over heating, ask them to turn the heating off before opening windows and doors.

If work is carried out in the roof space, for example electrical work, check that insulation is properly re-laid before the contractor leaves.

2 Heating

"Our heads are warm but our feet are freezing"

Up to 70% of a community building's energy costs will be spent on heating and it is therefore the most important area of energy consumption to control and use effectively. An efficient heating system, correctly programmed and managed, can make all the difference between a hall being used in the winter by a wide variety of groups creating a vibrant local community and an empty hall that no one wants to use.

"If the building was warmer more groups would book our hall"

HEATING ASSESSMENT CHECK

Assess the effectiveness of your heating system by ticking the statements that apply:

- ☐ The building isn't warm enough in winter
- ☐ We have to turn the heating on hours before use to heat it up enough
- ☐ We have a heating controller but nobody knows how to use it
- ☐ We have to supplement the system with portable heaters
- ☐ We think the heating is expensive to run
- ☐ Users leave the heating on after they leave
- ☐ The heating is set to come on and off at regular times every day
- ☐ The heating is set at the same temperature level for all users
- ☐ Both used and unused rooms are heated to the same temperature
- ☐ Our heating system is over 10 years old
- ☐ The building overheats and we have to open windows in winter

0 ticks	Well done, your heating system is effective and well managed
1 to 6 ticks	Consider making improvements to your heating system to improve the user experience and reduce your energy consumption
7 to 11 ticks	Heating improvements should be given high priority in your planning. You are likely to be losing users as a result of poor heating and heating costs can probably be reduced

"It's so cold in the winter that no one will use our building"

Identifying Opportunities

Energy saving opportunities fall into three categories, those that require system or building changes, those that require changes to the controls of an existing system and management actions. All of these categories may affect both the comfort of the hall and energy costs. There is often overlap in these areas, for example an old inefficient boiler with no programme controls may be costing you money as well as failing to heat the building adequately. If your building falls into the orange or red results of the self-assessment, the following lists will give you food for thought on solutions which might improve your building.

Note: the end notes ('H') are provided as supplementary information in the Heating Appendix at the back of this Guide.

Systems

Community buildings have a wide range of heating systems. Many rural communities do not have a gas connection and rely on oil or electricity to heat their building. System changes will normally require expert advice, and sometimes multiple quotes for the work.

- If your building is too cold or expensive to run, consider a different heating system e.g. move from radiant heaters to modern electric wall mounted heaters[H1].
- If you have an insulated building that is still cold then adding further radiators or relocating existing radiators may be required.
- If your boilers and heaters are old or inefficient, replace them with a modern energy efficient system, e.g. a combi boiler will heat the building and provide hot water on demand[H2].

Controls

Some building committees are happy to leave the control of the heating to their users who are diligent in turning it on to the correct level and off at the end of their hire period. However, in the majority of cases good heating controls will save money and energy.

- If your current central heating system does not have a programmer, install one and programme heating to match building use.
- If your building is heated with wall mounted electric heaters, install a multi-heater programmer that can programme your heaters together or separately from a central control point.
- If your heating regularly switches off when the building is not the correct temperature, try moving the thermostat away from a cold/warm location (e.g. by door in lobby) to a neutral location.
- If you feel your heating is wasting energy, install a timer to fine tune your heating, giving the user some control while not wasting energy – e.g. set back timer, interval timer etc.[H3].
- If your building has multiple lettable rooms, avoid heating spaces not in use by adding Thermostatic Radiator Valves and turning them down in unused rooms, toilets and corridors. Similarly, electric heaters can be set to a lower heat in those spaces.

Management Actions

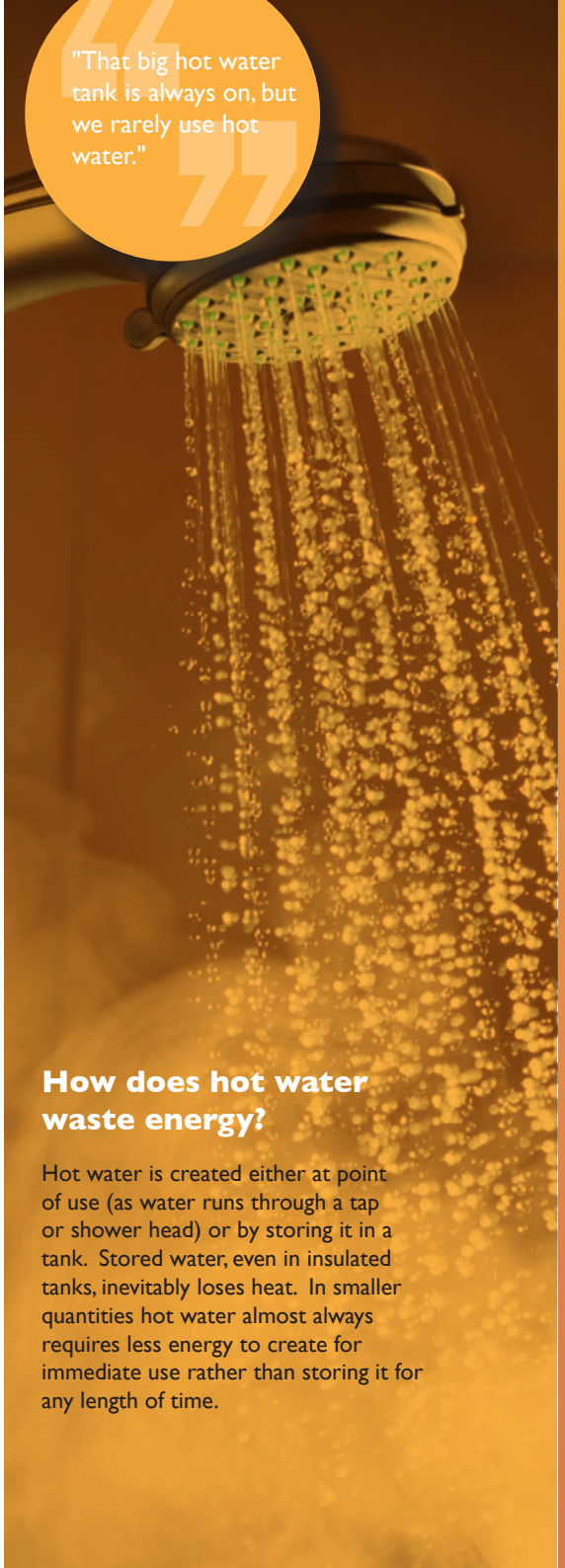
Not all energy efficiency actions need to cost money. Particularly with heating, actions taken by the management committee can have a significant effect on the comfort levels of the hall and heating costs. Consider the following management actions for your building:

- If your heating is controlled by a programmer, set your heating to come on just in time to heat up the building for the user groups and off 15 to 30 minutes before they are scheduled to leave.
- If you find yourself heating the whole building when only one room is in use, use free standing heaters for small meeting rooms [H4].
- If your building is heated by night storage heaters, set them to give out heat later in the day for buildings used in the evening.
- If you have a suitable programmer, programme heating for temperature as well as time. For example programme the building to heat to 16°C for a Pilates class and 22°C for the bridge club.
- If you have a broadband connection in your building, control your heating remotely via the new range of heating programmers which are controlled by mobile phone apps.
- If you want your users to take some responsibility for energy consumption, communicate good practice to your users by signage that explains how the heating is controlled, shares heating costs and encourages users to turn off.
- If the flow of heat from the radiators into the room is restricted by furniture or storage, move the obstacles and speak to users to prevent re-occurrence.

3 Hot water

Hot water can be a small portion of the total energy spend in many community buildings. Most demand comes from sinks in kitchens and toilets. However, in sports pavilions and similar spaces with showers, providing hot water can be a much larger percentage of your spend on energy. The Carbon Trust estimates energy for hot water can be up to 17% of total usage in sports facilities. Energy used on heating water can be reduced by installing systems and controls appropriate for hot water demand and through careful management of the systems in place.

"There is never enough hot water for washing up."



"That big hot water tank is always on, but we rarely use hot water."

How does hot water waste energy?

Hot water is created either at point of use (as water runs through a tap or shower head) or by storing it in a tank. Stored water, even in insulated tanks, inevitably loses heat. In smaller quantities hot water almost always requires less energy to create for immediate use rather than storing it for any length of time.

HOT WATER ASSESSMENT CHECK

Assess the energy efficiency of your hot water by ticking the statements that apply:

- ☐ Most or all of the building's hot water is heated then stored in a tank for later use
- ☐ There are no controls to manage the hot water; it's always available at the tap
- ☐ Some hot water taps or showers are rarely or never used
- ☐ Hot water never runs out no matter how much is used
- ☐ Our hot water system is over 10 years old
- ☐ Our hot water tanks and pipes have partial or no insulation cover
- ☐ We have a hot water boiler for hot drinks that is always on

"I have to wait ages for hot water!"

0 ticks	Your hot water system is very likely to be effectively managed to reduce wasted energy - well done!
1 to 3 ticks	There may be some improvements to the system, its controls, or overall management that will reduce energy costs on water heating.
4 to 7 ticks	There may be a lot of energy savings to realise with improvements to water heating in the building.

One community building had a combi-boiler that provided heating and hot water on demand. Unfortunately it was located quite far from the toilets. Users had to wait a few minutes before hot water came through and most had washed their hands before hot water arrived, meaning the boiler was firing but users were not benefiting. When the building was refurbished the boiler and toilets were moved much closer together.

CASE STUDY

Headington Quarry Village Hall was heating a 90 litre tank of hot water to wash up cups and saucers after WI meetings and bingo. As they were replacing the heating system anyway, they removed this tank and installed a combi boiler which provides ample hot water on demand as well as heating the radiators.

What about Legionella?

Legionella is a type of pneumonia caused by breathing in small droplets of water containing the bacteria. The bacteria thrive in temperatures between 20 - 45 degrees. Some buildings may be required to manage their water outlets to control the risk[HW4].

Identifying Opportunities

Hot water energy saving opportunities are often found when the hot water system is incorrectly sized for current use. Opportunities exist to improve the availability of hot water through timed controls, whilst setting temperature appropriate to user needs can also save energy. Finally, there are management actions that can help reduce wasted energy through hot water. If hot water in your community building falls into the orange or red results of the assessment, the following suggestions might help you to reduce energy use for hot water.

Note: the end notes ('HW') are provided in the Hot Water appendix at the end of this guide.

Systems

- If there is a standing tank of water and overall hot water demand is low, the tank can be removed or replaced with a much smaller tank or with an electric point of use hot water heater. [HW1]
- If hot water tanks and connecting hot water pipework are not insulated, a boiler jacket and pipe insulation can be added at relatively low cost. [HW2]
- If the only time there is not enough hot water is when dishes are being washed, a dishwasher (that generates its own hot water) may be a good solution, particularly for buildings that host parties and similar functions. [HW3]

Controls

- If there are small electric hot water tanks or a hot water boiler for drinks, timers can be fitted to these and set to match occupancy times[HW5].
- If there are showers that are used at unpredictable times, controls can be installed to provide users with hot water for only a short period of time [HW6].
- If showers or sink taps are left on by users, taps could be replaced with push buttons that provide hot water for a short time which helps avoid wasting hot water [HW7].
- If your sports facility uses large hot water tanks to feed showers, add timing controls so that the water is only heated when needed.
- If showers are not hot enough, hot water temperature, which is usually set at 60°C, can be increased, particularly if the hot water tanks are a long way from the showers.

Management Actions

Consider the following management actions for your building:

- If your hot water is constantly on it can be switched off manually by users or building volunteers, though it may need to be switched on again before the next let.
- If there are any special instructions, such as switching on hot water or the amount of time before hot water is available, ensure that building users are provided with clear, visible instructions.
- If a timer is available, use this to set 'on' times according to periods of usage, and ensure that water heating is off at other times.
- If your hot water for toilets is provided by under-sink immersion heaters and use is low, consider replacing the immersion heater with an on-demand hot water tap. [HW1]
- If hot water for drinks is provided by kettles and there is high demand, consider installing an instant hot water boiler for drinks. This is a modern replacement for an urn.

Not all users of sporting grounds will shower there afterwards. Providing an option for a single person to shower will eliminate the need to heat water for two large sports teams. Consider adding a separate single electrically heated shower to provide this option.

4 Lighting

The Carbon Trust suggests that lighting can be 11% or more of a building's total energy costs. Community buildings need to light their spaces appropriately for the activities taking place. Outdoor lights are used after dark while lights within the building are used to supplement natural light throughout the day. There are a vast range of lighting types and technologies that all produce light at different efficiency levels. Lighting controls as well as user behaviour determine how closely lighting use matches need. The ideal lighting system provides light only in the presence of users that is appropriate for activities and uses minimal energy.

"We sometimes wait for a good number of lights to fail before we arrange to climb up and replace them"

"We either have too little or too much lighting, there is no way to have just the right amount"

How do lights waste energy?

Energy is wasted when:

Lights are on and no users are present (with the exception of security lighting)

Lighting is not appropriately located to effectively illuminate an activity

Available natural light is not used or too much lighting is used

More efficient lighting technology is available (for example comparable compact fluorescent or LED bulbs are more efficient than incandescent bulbs)

LIGHTING ASSESSMENT CHECK

Assess the energy efficiency of the lighting in your community building by ticking the statements that apply:

- ☐ Lights burn out or stop working frequently
- ☐ The lighting system is 10 years old or more
- ☐ Finding suitable light replacements has been very difficult
- ☐ There is not enough lighting for some activities
- ☐ Lights are left on when no one is there
- ☐ The lights are difficult to access to replace them
- ☐ Occasionally there is too much lighting

0 ticks	Your lighting system is energy efficient and well managed - well done!
1 to 3 ticks	Some actions may improve lighting and / or reduce the amount of electricity lighting uses.
4 to 7 ticks	Improvements to the lights and / or lighting controls are likely to yield savings on energy and costs.

Ambient lighting

Some community buildings host events where less direct lighting levels might be needed, for example parties with low lighting. Many lights, including LEDs and compact fluorescents, can be dimmed, though some buildings will have a second set of lights to provide this effect. The second set of lights can be aimed at walls or ceilings to improve ambience, however the main set of lights is most effective if all light is directed towards the floor.

"I always find the lights on in the toilets when there is no one around"

Identifying Opportunities

Lighting energy saving opportunities include system changes to the fixtures or bulbs or the number and style of lights. Lighting controls can be changed to be more suited to usage or to automatically switch off if users forget. Some controls can also facilitate use of different lights or light levels to improve the ambience for parties etc. Finally, there are some management actions to ensure lights are fit for purpose and that users minimise wasted energy from lighting. If lighting in your community building falls into the orange or red results of the assessment, the following suggestions might help you to reduce energy use for lighting.

Note: the end notes ('L') are provided in the Lighting Appendix at the end of this guide.

Systems

- If your lighting is not energy efficient, buy equivalent low energy bulbs or tubes and install these. The cost of LED lighting is rapidly falling and is likely to be the most cost effective solution for a well-used building. Ensure replacements are truly equivalent and are compatible with existing lighting fixtures[L1].

Controls

- If lights are often left on when users have left the room, consider installing additional sensors that switch off lights when no movement is detected. Sensors might only be necessary in toilets and storage rooms or for meeting rooms and halls as well.
- If new light fixtures are being installed, consider additional controls that switch off lights when there is no movement detected or lights that switch off when natural lighting is sufficient[L4].
- If a room has multiple switches to control the lights, ensure there is logic to the lighting, for example if there is a switch for a row of lights along a wall with windows then users can switch this off when not needed. Switches need to be compatible with potential use of the space, for example do lights need to be off at the front of the hall for films and presentations? An electrician can rewire lighting so there is more logic to which lights can be on or off.
- If outdoor lighting is installed to allow users to see when leaving the building, consider adding an appropriately set timer that switches the light off after they have left.
- If outside security lighting is triggered by motion, consider what conditions might switch the light on or off and install appropriate controls so the lighting is not on when no one is there.

Management Actions

- If light switches are manually controlled, ensure these are labelled for users to understand what is lit by each switch.
- If you have ambient lighting as well as main overhead lighting label the switches by use e.g. "Party Lighting", "Overhead Lighting" to avoid users turning all the lights on every time they use the room.
- If users of the building still leave manually controlled lights on when not needed, consider imposing a fine, clearly explained in the rental agreement, to cover the costs of wasted energy.

- If your lighting system is old, invest in new fixtures as well as new bulbs and tubes. A lighting contractor may be able to assist in determining appropriate lights and locations.
- If lights are high or difficult to access, consider lowering or relocating lighting fixtures. A lighting contractor or electrician will be required to carry out this work. Ensure all activities in the building are considered when altering the lighting[L2].
- If the building is being refurbished, maximise use of natural lighting, where possible. This may include adding windows, skylights or, light tunnels[L3].

Are some bulbs âtter than others?

Not all bulbs are equal. Indeed some compact fluorescent bulbs start dimly and provide inadequate light. However this is not the case for all bulbs and new labelling laws require a range of information to be shown so that bulbs can be easily compared. The brightness of bulbs is no longer referred to in "watts"; the term "lumens" is now used to express a light's brightness!

5 Renewable Energy

"Our air source heat pump heats the water for our radiators and reduces our electricity bill."

The final chapter of this guide is about the use of renewable sources of energy such as solar and wind power, rather than non-renewable fossil fuels. This is the last chapter as energy efficiency actions covered in previous chapters should be addressed before you install renewable solutions. Renewables and energy efficiency are interrelated and maximum savings are achieved when they are considered together. For example, by changing to LED lights before installing solar PV panels the building's electricity requirements will be reduced and a smaller number of solar panels will be required to support electricity needs.

There is a wide range of ways to use renewable sources of energy, and the best fit for your community building will partially depend on needs, location and building orientation. Successive government policies to reduce the country's dependence on fossil fuels have led to subsidies for some renewable energy solutions. The 'Feed In Tariff' (FIT) is a funding mechanism that supports solar powered electricity generation. The 'Renewable Heat Incentive' (RHI) supports several forms of heating powered by renewable forms of energy. While these incentives are currently under review, they may help make the installation of renewable energy technology something worth considering for community buildings as they will result immediately in carbon savings, will reduce the impact of any price rises introduced by your energy supplier and, in the medium to long term, will yield significant financial savings.

"Our solar panels are generating even more electricity than we expected!"

RENEWABLE ENERGY ASSESSMENT CHECK

Assess the feasibility of using renewable sources of energy by ticking the statements that apply:

- ☐ Lights are regularly on in our building during the day
- ☐ We use electricity during the day for other purposes e.g. cooking, computers
- ☐ Bookings show that our building is used a great deal during daylight hours
- ☐ Our building is heated using only electricity or oil
- ☐ Our oil or electric heating system is old and we are considering replacing it
- ☐ We are planning to build a new building or extension to our existing building

0 ticks	Your building is unlikely to benefit financially from installing renewable energy.
1 to 3 ticks	Some form of renewable energy may be appropriate for your building.
4 to 6 ticks	Renewable forms of energy should be investigated for your building.

"We are considering a biomass boiler as we have a local community woodland that could supply the fuel"

Use renewable power while the sun shines

In a domestic home it is fairly easy to maximise the use of solar electricity by running appliances such as dishwashers and washing machines during the day when the sun is shining. However this is not so easy in community buildings. Heating a large electric hot water tank may be one such opportunity but look out for more opportunities in your building.

Identifying Opportunities

Note: the end notes ('R') are provided as supplementary information in the Appendix at the back of this Guide.

Solar PV

Solar generated electricity is most financially viable when used immediately on site as it is being generated from the sun. This is due to the funding mechanism that supports use of the generated energy in the host building before residual electricity is transferred to the National Grid. Consider whether you have regular electricity use in your building during daylight hours and what types of activities happen during that time when specifying a system.

There are three ways that you will gain financially by installing solar panels to generate electricity.

On-site Use - When you use electricity generated directly to power electrical items in your building, such as lights, computers or contribute to electric heating, you will avoid having to purchase that electricity from your energy supplier.

Export Tariff - You will get paid by your energy supplier in recognition of electricity you generate on site and export back to the electricity grid. At some stage in the future export meters will be installed to measure what electricity is exported, but until then it is estimated as being 50% of the electricity you generate (systems over 30kW need to have an export meter fitted).

Generation tariff - your energy supplier will pay you a set rate for each unit or kWh of electricity you generate, whether you use it on site or export it. Ofgem, the body that regulates generation, provides up to date figures on current rates. Once your system has been registered, the tariff levels are guaranteed for the period of the tariff (currently 20 years) and are index-linked.

Heating from Renewable Sources

Using renewable sources of heat may be a financially viable option if your building is heated by oil or electricity. With the current cost of gas, it is not normally cost-effective to change from a gas heating system to a heating system fuelled by renewable energy.

The RHI scheme is designed to bridge the gap between the cost of fossil fuel heat installations and renewable heat alternatives through financial support for owners. It provides a subsidy, payable for 20 years, to eligible, non-domestic renewable heat generators. You will be paid for every kWh of energy you generate from renewable heating systems. (For current tariffs visit the Ofgem website).

There are four eligible renewable heating system options for a community building. These are:

- **air source heat pumps** that transfer warmth from the air to provide heating [R1]
- **biomass boilers** that efficiently burn wood to generate heat [R2]
- **ground source heat pumps** that transfer warmth from the ground to provide heating [R3]
- **flat plate and evacuated tuâ solar thermal panels** (solar hot water) that use the sun to directly heat water [R4]

In order to qualify for the FIT or the RHI, no public money can be used to pay for the system. Beware of this caveat when considering funding models for a renewable energy installation.

CASE STUDY

Before installing solar PV panels, Northmoor Village Hall are improving insulation, upgrading boiler controls and replacing lights with new LEDs. Hall volunteers recognize that energy efficiency reduces usage and maximizes the power produced by renewable energy.

CASE STUDY

While rebuilding, Wooton and Dry Sandford Village Hall also re-laid their large car park. Before doing so they laid ground source heating coils under the tarmac which provides the majority of the heating for their hall.

Systems

Solar PV

- If you have a south or west facing pitched roof and use electricity in your building regularly during the day, consider adding photovoltaic panels to your roof. To be eligible for the Feed In Tariff a qualified solar installer will need to be used.
- If you have a tall building and are carrying out roof repairs that involve scaffolding, this may be the time to consider solar panels to avoid repeating costs.
- If you have a flat roof solar PV panels are still possible. They simply have to be installed on a tilted mounting system.
- If you live in a conservation area, consult your local conservation officer before considering solar PV panels. They will often require that roof-mounted PV panels are not visible from the road.

CASE STUDY

Souldern Village Hall has installed an air-source heat pump and solar hot water collector to heat the hot water for their central heating system. There is a back-up electric heater to supplement this renewable system when required.

Renewable Heat

- If you are planning to replace your oil or electric heating system it is worth investigating renewable heat options. See toe2's publication "Introduction to Biomass Heating" for more information.
- If you are renewing playing fields beside your building, ground source heating is worth considering as the solution may be feasible.

- If your building is in a rural location, with space around the sides and a ready source of wood fuel, a biomass boiler could be considered.
- If you have multiple showers that are used for sports team showering during the day or early evening in the summer, it is worth considering solar hot water heating to heat your large tanks of water.
- If you are considering under-floor heating for a refurbishment or new build, consider using a renewable form of heating that heats hot water for the under-floor coils. As these under-floor heating coils operate at a lower temperature than standard radiators this form of heating is particularly compatible with renewable forms of heat.

CASE STUDY

Eynsham Village Hall is a well used community building in a rural setting. In partnership with a local social enterprise group, they retrofitted 55 solar PV panels on the roofs of their village hall and presbytery which is generating over 10,000 kW of electricity per annum.

Management Actions

- If you are using renewable sources of power, share the information with your users through demonstrations, signage and word-of-mouth.
- If you are considering solar PV panels and are uncertain of how much electricity you use during the day, take meter readings at the beginning and end of daylight hours for a typical week to determine daytime energy use.

- If you have installed renewable energy technology, measure and monitor energy use from your renewable energy as well as from your energy supplier to track savings.

6 User Awareness

The main use of community buildings is for local activities, often in the absence of building committee members. How users behave towards energy use is therefore important and improving the energy efficiency of community buildings provides a good opportunity to inform current and potential users about changes as well as expectations about their behaviour.

Below are some suggestions to ensure users can benefit from energy improvements to buildings.

Communication

What are the usual forms of communication to current and potential building users? A website? The rental agreement? Are there signs? Is there an information display board in the building? Do volunteers explain information verbally?

Whatever the forms of communication, these can be used not only to highlight controls and expectations (such as switching off lights), but also wider messages of the aim to save energy, carbon and costs.

Incentives

Sometimes communication on its own does not motivate appropriate environmental behaviour. What incentives or disincentives have been considered? Do rental charges fully cover actual energy costs? Can a user be required to provide a deposit that is forfeit if certain actions are not taken? Or perhaps a discount can be arranged if particularly good environmental behaviour occurs. In some cases a fine could be charged if heating or lighting is left on after the user agrees to turn it off.

Encouragement

Some energy improvements in a community building may introduce new approaches or technology of great interest to members of the community. Are opportunities to showcase good practice to locals offered? Will there be an opening or launch demonstrating the benefits of new improvements? Is further information available through any forms of communication, such as the website? Community buildings are well placed to showcase upgrades to lighting, heating, insulation and even renewables that could be replicated at home. Have users been encouraged to consider similar improvements?

6 APPENDIX

Insulation

I1

Purpose designed fixtures can be added to ceiling lights allowing you to insulate over and around them without the risk of lighting overheating or causing fire. Insulating in all areas helps further reduce heat loss through your roof or ceiling. These units are usually specific to the type of lighting you have so it is important to contact a lighting supplier to ensure that the correct fixtures are purchased and installed properly.

I2

Magnet secondary glazing from companies like Magnaglaze and Extraglaze consists of lightweight ready-made acrylic window panels along with magnetic strips which are directly applied to existing windows. The magnetic strips allow secondary glazing panels to be applied to existing windows with no damage. These can be purchased for DIY installation, or fitted by the suppliers. This type of glazing is particularly suitable for listed buildings as the installation is temporary and makes no lasting alteration to the existing windows.

Heating

H1

Modern direct convection electric radiators are comparatively cheap to purchase and install and provide both timing and thermostatic control to regulate temperature and usage. They are usually wall mounted and provide a viable alternative to a wet central heating system in areas where there is no gas connection. Like any electric system they are more expensive to run than gas alternatives and require careful attention to heating times and levels to ensure that they do not increase running costs.

Infrared (IR) radiant heating systems have often been installed in community buildings. These are designed to provide heat to people rather than the space around them. They are usually electric but gas versions do exist. They are nominally very efficient, translating around 85% of the energy input into heat. However, in many cases these systems are now considered inadequate. They provide heating to users' heads and upper bodies but users' extremities (in particular feet) may not be heated by this system.

H2

Most gas heating provides heat through a 'wet' central heating system. The boiler heats water which then circulates through a system of radiators within the building. The radiators actually heat the air through convection. Heated air rises and cooling air falls, circulating the warm air throughout the whole space.

Some systems include a hot water cylinder which is connected to the boiler. The boiler heats additional water which can be stored in this cylinder before being used for hot water requirements such as hand washing. Combi boilers remove the need for a water cylinder. They heat water at the point of requirement, providing instant hot water through taps in the building.

H3

Timing controls can be added to most heating systems which are centrally controlled. Even free standing heaters may have some kind of heating control included.

At their simplest, timers will switch heating on for a period of time, defined by the user, before switching it off again. Most will allow several on and off periods each day. More advanced units will allow different heating times to be set for each day depending on user requirements for a period of at least 7 days.

Some timing units will also allow temperature to be set and, if zoning control is added, run separate areas of heating independently via a single boiler allowing different zones to be switched on and off.

New 'smart' heating control systems are now available which allow control of temperature and timing remotely from a PC or smart phone via the internet. These systems require an internet connection at the site where the heating is to be controlled, but are becoming comparable in cost to standard timing systems. Truly 'smart' systems gather information about usage and required temperature levels and are able to learn what heating settings are required in a space and heat to the required level and for the appropriate length of time without needing any user input.

H4

Free standing, portable heaters come in a range of sizes and can be either electric (most commonly) or gas (fuelled by a cylinder of LPG). Oil filled units can be most efficient as they take longer to discharge the heat that they store during operation, meaning they are warm to the touch for longer after they have been switched off.

Electric free standing systems provide heating in much the same way as a direct electric system however they are generally less sophisticated and often lack thermostatic control or the ability to set timings.

Hot water

HW1

Small electric point of use hot water units can be used to provide limited volumes of hot water in areas with no connection to traditional boiler fed hot water systems, for example in kitchens or toilets. These units sit over a counter, or in a cupboard.

On-demand instant hot water heaters are suitable for hand washing while small tank units that store between 10 and 30 litres of hot water are more effective for kitchens or toilets in larger community buildings. Tanked units should ideally be fitted with a timer unit, ensuring that they do not run overnight.

HW2

Pipework is designed to deliver hot water to the place it is needed. However, if pipework is uninsulated the water will lose some of its heat before it gets to the required room which means that the boiler has to work harder. Each metre of un-insulated pipework loses around 100 w/hr – equivalent to an old-style light bulb. This is a low cost improvement as pipe insulation can be bought locally or on-line and installed by a volunteer.

Hot water tanks are insulated by design. However, the levels of insulation, even in the newest cylinders can be improved through addition of cylinder jackets. These are jackets filled with insulating material that fit snuggly around your hot water cylinder, reducing heat loss from the stored hot water.

HW3

Dishwashers will have an EU energy use label. Procure the most energy efficient models (A or A+). Ensure the dishwasher size is appropriate for the number of users.
To reduce wasted energy, ensure the dishwasher is full before operating.

HW4

Legionella bacteria grow easily in warm water between 20 - 45°C and may multiply to hazardous numbers in areas where water can collect. Shower heads produce a fine spray and aerosol and are an ideal source for legionella bacteria. In order to mitigate the risk:

1) Water temperatures in the boiler should be set to reach at least 60°C. Check water temperature at the tank outlet on a monthly basis and record findings.

2) Water temperature at the sentinel taps (furthest from boiler) should be at least 50 °C within one minute of running the water. Monthly checks should be carried out and findings recorded.

3) Cold water temperatures should be below 20°C after running for 2 minutes. Monthly checks should be carried out at sentinel taps and findings recorded.

4) Showerheads should be dismantled, cleaned and descaled quarterly.

Avoid stagnation in long pipework. Remove dead ends and unnecessarily long pipework runs where possible. For infrequently used outlets, instigate a programme of regular flushing, i.e. weekly, purging of drains.

HW5

Electric hot water tanks are wired directly and require a qualified electrician to install a timer. Timers are often programmable for 7 days, however, 365 day timers are available and may be useful if building occupancy changes regularly. Ensure timers are set to match user needs. Alternatively, a simple boost button can be installed. When pressed, this timer switches on the hot water for a fixed period, for example one hour, then automatically switches itself off.

HW6

As above, an electrician can install a boost button or timer dial that, when operated, provides hot water for a fixed period of time e.g. 1 hour, then switches off.

HW7

Depending on the circumstances, shower controls can include motion sensors installed by experienced contractors and set with the appropriate sensitivity to movement and time duration. Alternatively mechanical push buttons can be installed that also provide a flow of water for a short time.e.g. 3 minutes.

Lighting

L1

Consult a lighting supplier to determine if LEDs or low energy lights are compatible with your existing fixtures. LED tubes can replace most fluorescent tubes with a minor alteration to the fixture. LED tubes generally are no longer than 5 feet.

L2

Some sporting activities might damage lights that are in the way or not protected. Similarly, lowering light fixtures may obscure sight of a stage or presentation area. Discuss these issues with your committee before taking action.

L3

Light tunnels are tubes from the outside of a building to the inside that redirect natural external light and appear as a light fixture inside a building. They are suitable for both pitched and flat roofs. They are often easier to install when a roof is being refinished.

L4

Absence lighting detectors use infrared to detect the presence of people in a room to keep lighting switched on. When users leave, the detector can no longer detect the infrared radiation and automatically switches off the lighting (usually after a short period of time).

Photo sensors (or light level sensors) measure the light levels in a room and switch off interior lights if there is enough natural lighting to meet the lighting requirement for the space.

Renewable energy

R1 Air source heating systems

Air to water heat pumps qualify for the Renewable Heat Incentive. They use the constant energy available in the air, passed through a refrigerant circuit, to boost the temperature to a useful level for heating or hot water. This water is then used to run a conventional central heating system either based on radiators or underfloor heating. The air source heat pump needs electricity to run, but uses less electrical energy than the heat it produces.

R2 Bio mass heating systems

Biomass boilers qualify for the RHI subsidy. A biomass boiler in the UK would normally use logs, wood chips, and wood pellets as its fuel source. It is most feasible if either designed as part of new building construction or as a replacement for a boiler. Ideally a community building will consider a biomass boiler where there is a locally available source of fuel. Each fuel type has a different cost, availability and practical application for a community building.

The running of a biomass boiler requires wood fuel to be transported and stored on site as well as fed into the boiler. Though the running of the boiler is mostly automated, volunteers need to be trained in its management.

R3 Ground heat source heating systems

Ground Source Heat Pumps harness the relatively stable underground heat by pumping water through coils, using compression to increase the temperature of the water which can then be used for heating or hot water. The coils can be installed vertically or horizontally depending on available space. The pump needs electricity to run, but the system produces heat much more efficiently than conventional heating systems. The heat pump performs the same role as a boiler does in a central heating system, but it uses ambient heat from the ground rather than burning fuel to generate heat.

R4 Solar hot water

Solar water heating systems use collectors, either tubes or flat plates, fitted to the building's roof to collect heat from the sun to heat water which is then stored in a hot water cylinder for use. Although they work year round, these systems normally require a boiler or immersion heater to be present as well to provide back up for days with little sunshine and to bring partly heated water to the required temperature. Solar hot water systems require a roof space that faces the sun for most of the day, but can be added to a flat roof on a frame. They also require an additional hot water cylinder with a solar heating coil. You also need to ensure that the boiler you have is compatible. Combi boilers don't have a hot water tank so are usually not compatible.

The Trust for Oxfordshire's Environment (TOE2) is a charity and an independent environmental funder aiming to support strategic priorities and local community initiatives which increase the biodiversity of wildlife habitats, improve access to green spaces and contribute to the low carbon agenda in Oxfordshire.

Managing Energy Use in Your Community Building has been produced as part of TOE2's ENRICH Programme (Energy Reduction in Community Halls) which is delivered through EiE at Oxford Brookes University and funded by the Patsy Wood Trust. The guide is also available as a free pdf download from our website www.trustforoxfordshire.org.uk.

This guide is one of a series of guides being produced by TOE2; *Making the Most of your Oxfordshire Woodland* and *Introduction to Biomass Heating* are also available free as hard copies or as pdf downloads from our website.

The authors of this guide, EiE at Oxford Brookes University, provide energy, water, and waste reduction support to UK organisations in order to reduce environmental impacts and improve sustainability.

www.brookes.ac.uk/eie
T: 01865 483299
eie@brookes.ac.uk

TOE²
Earth Trust Centre.
Little Wittenham, Oxfordshire
OX14 4QZ
T: 01865 407003
admin@trustforoxfordshire.org.uk

Please recycle

Printed on paper from a sustainable source

toe2 Trust for Oxfordshire's Environment

Putting people and places together

www.trustforoxfordshire.org.uk

Patsy Wood Trust