Energy Report for Chirbury Village Hall

Prepared by Heather Moody, on behalf of Lightfoot Energy Service

Disclaimer

While reasonable steps have been made to ensure that the information in this report is accurate and complete, Lightfoot Enterprises CIC cannot be held liable for any loss or damage – direct, indirect or consequential – that results from work undertaken on the basis of the recommendations. Nothing in this report is intended as, or should be interpreted as, an endorsement of or recommendation for any supplier, product or service. Any person making use of this report does so at their own risk. The companies listed in this report are offered as an indication of possible suppliers or installers. We advise you to get at least three quotes for any work to be done and to seek third party recommendations from other satisfied customers.

Remit of this report

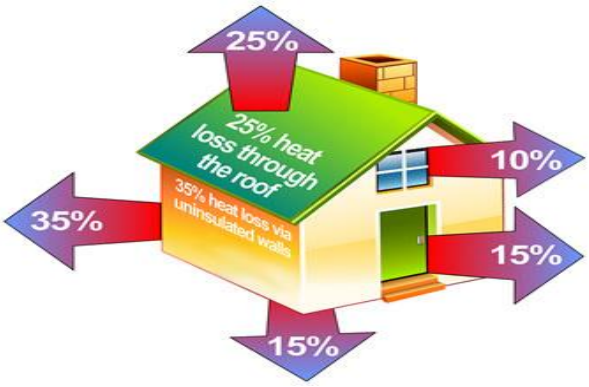
This report is intended to provide an overview of the current energy efficiency status of Chirbury Hall and to provide ideas for how the energy efficiency and heating of the hall can be improved. The purpose of this report is to inform, not instruct. This report will simply describe the options that are technically feasible, give an idea of the costs and any potential savings (where figures are available) and the pros and cons of each measure. The intention is to make the management committee of the hall aware of what can be done, not prescribe what should be done.

Description of the Hall

The main part of Chirbury Village Hall was built in the early 1900s and is of solid brick construction with a pitched roof and traditional windows which have had secondary glazing. There are solid wooden doors at the front and a wooden glass door at the back. The Hall comprises of the main hall, foyer, back room, toilets and kitchen. The back room was built as an extension to the main hall in the early 1990s.
The Hall is used on a weekly basis by various groups and members of the community. There are strip lights throughout the majority of the hall with some halogen lights in the back room. The Hall is currently heated by electric radiant heaters when the hall is in use.

LEADER
The European Agricultural Fund for Rural Development: Europe investing in rural areas
Department for Environment Food & Rural Affairs
Shropshire Hills Area of Outstanding Natural Beauty

As you can see from the image below, a significant amount of heat can be lost through the fabric of a building if it is not insulated adequately. Insulation measures should be priority when considering increasing the energy efficiency of any building. The insulation levels at Chirbury Village Hall could be improved by a number of various measures. As the hall is in a conservation area there are limits as to what can be done to the hall which may affect the appearance. The committee have had experiences of this in the past when looking to replace the windows. The solution was to install secondary glazing. This is a good measure as it lowers the U-Value of the window; the U-Value is the rate at which heat is lost through a building fabric by watts per meter^2.



The ceiling in the main hall is pitched with presumably no insulation. The ceiling could be insulated by using rigid insulation boards. The external double door in the main hall is of traditional wooden build and there is evidence of gaps which creates draughts. This could be easily rectified by replacing the draught proofing strips at the bottom of the doors. The walls in the main hall are solid brick which don't retain the heat as well as a cavity wall. The main solution to this would be to install internal wall insulation (External would probably not be permitted as it's in a conservation area). There are signs of condensation in the back room on the windows. This is most likely a result of lack of heating. There are also some damp patches on the wall and ceiling in the toilets. There are several reasons why dampness in buildings occur, the most likely cause in this case is due to lack of heating and insulation, however, it may be wise to seek advice from a structural surveyor to ensure that there are not underlying issues such as rising damp. The best way to alleviate issues with condensation and damp would be to keep the hall heated at a constant low temperature. However due to the low insulation levels and the irregular use of the hall this would not prove very cost effective.

Electricity Usage

The estimated average annual electricity usage for the hall is about 7120 kWh. This includes the heating of the hall with electric radiant heaters. Electricity produces 0.43kg of CO_2 per kWh, therefore the hall produces just over 3 tonnes of CO_2 per year through electricity usage. The hall is lighted mainly by strip lights which are low energy and last a long time. There are some halogen spotlights in the back room, if the bulbs were switched to LED bulbs this would reduce electricity consumption. Although LED bulbs are more expensive than halogen bulbs they use a lot less electricity and last much longer.

To reduce the carbon footprint the ideal alternative would be to install Solar PV panels, however, there may be planning issues that would have to be overcome. Another alternative to reduce the

carbon footprint would be to switch to a green electricity tariff such as Good Energy who produce all of their electricity from renewable resources.

Energy Use of the Hall

The hall is currently heated only when the hall is in use with electric radiant heaters. These are switched on 30 minutes before the hall is due to be used and heat the hall to a comfortable level. This means that the heat travels directly as an infra-red beam straight from the heater and heats the first solid object it meets. It does not heat the air in the room or anything in the "shadow" of the first solid object it meets. This has the distinct advantage of only heating what you want to heat – the people in the hall – and it is therefore very efficient. However, as radiant heaters don't heat the air, the hall would go cold very quickly causing issues with condensation and damp which are evident in the toilets. There are several alternative heating measures that could be considered:

Electric convector heaters

The cheapest heating to install would be on-peak electric convector heaters. These could be installed by any qualified electrician and are easy to control. The ideal type would be heaters with built-in timers and thermostats as this will increase the level of control of the heating demands. Electric convector heaters would heat the air in the room making it more comfortable for hall users. Heat would also go into the fabric of the building and help to protect it from damp and condensation.
The main disadvantage of this heating method would be the cost; it would be more expensive to run than the existing radiant heat source because the air and the building fabric would be heated whereas they currently are not. On peak electric heating is also the most environmentally damaging source of energy due to our current reliance on fossil fuels for electricity generation and the inefficiencies of power transmission.

Central Heating

Heating the building using a central boiler and radiators would be the most effective method of heating the hall but would require a high capital investment. The heat provided by radiators would provide a comfortable heat for users and currently unheated or under-heated areas, could readily be heated. Unlike with the current radiant heaters, some heat would be retained after the heating has switched off which would improve comfort and help to protect the fabric of the building; however, given the lack of insulation in the building the heat would not be retained for very long.
Central heating systems can also be fitted with timers and thermostats to control when the hall is heated and to what degree it is heated – thus ensuring that it is not heated unnecessarily. Individual radiators would have Thermostatic Radiator Valves (TRVs) fitted so that different rooms could be heated to different levels. The building could even be "zoned" so that the heating of the main hall and the kitchen/back room/toilets are controlled separately.
Many different fuels can be used for central heating systems: mains gas, oil, LPG, or wood. There are several disadvantages to using fossil fuels; they have a high carbon footprint, they are a finite resource which is rapidly depleting, it is generally sourced from politically volatile countries, which causes issues with security of supply, these issues combined results in ever-increasing costs for the end user. The ideal solution would be to switch to renewable heating method. Renewable heating can be much cheaper to run, however this comes with a higher capital cost.

Renewable Energy Options

Below shows comparisons of the costs and CO_2 emissions of fossil fuels and renewable sources.

Fuel	Price per unit	kWh per unit	pence per kWh
Wood chips (30% MC)	£100 per tonne	3,500 kWh/t	2.9p/kWh
Wood pellets	£200 per tonne	4,800 kWh/t	4.2p/kWh
Natural gas	4.8p/kWh	1	4.8p/kWh
Heating oil	60p per litre	10 kWh/ltr	6.0p/kWh
LPG (bulk)	50p per litre	6.6 kWh/ltr	7.6p/kWh
Electricity	14.5p/kWh	1	14.5p/kWh

(source: Biomass Energy Centre)

Fuel	Kg CO_2/kWh
Electricity	0.43
Oil	0.26
LPG	0.23
Mains Gas	0.19
Wood Pellets	0.03

Although renewable systems offer cheaper fuel with a lighter carbon footprint the main disadvantage is the high capital cost of installation. However, Chirbury Village Hall could take advantage of the Renewable Heat Incentive (see below for details).

Biomass Boilers

Biomass heating systems benefit from low fuel costs and low CO_2 emissions. The advantage of using wood as fuel is that when wood is burnt it gives of the same CO_2 emissions as it would if it were left to naturally decompose. There is also the advantage of using wood that would otherwise end up in landfill and it can be sourced locally. Biomass systems come in 3 types; log, chip and pellet. Log boilers tend to need manually re-fuelling, wood chip and pellet boilers are either manual or automatic feed. They tend to be larger than fossil fuel boilers and would require space to store the fuel.

Is a biomass boiler suitable for Chirbury Village Hall?

A biomass boiler tends to be larger than a fossil fuelled boiler so space is required for the boiler and storage of the fuel. Some types of biomass boiler work just the same as an ordinary oil fired boiler. A boiler with automatic feed would require very little maintenance. Heating controls and a programmer means that it could be timed to come on when the hall is in use. Although biomass boilers tend to be expensive they are eligible to claim the Renewable Heat Incentive, see below for details.

Solar Photovoltaic Panels

Solar photovoltaic (PV) panels produce electricity from the sun which can be used directly or fed into the grid. A non-shaded roof or ground based frame is required, preferably south, south east or south west facing. On a south facing roof you would expect to generate at least 800kWh a year per kWp. A grid connected system exports electricity back to the grid when the electricity is not used and imports it if more electricity is required. Solar PV system is easy to install, with no moving parts requires little maintenance and will work even on cloudy days (daylight, not sunshine, is enough to generate power), and is very reliable but is a long-term investment. Solar PV panels are eligible for the Feed in Tariff, see below for details.

Are solar PV panels suitable for Chirbury Village Hall?

The hall is in an ideal position for solar gains, they could possibly be installed on the main hall roof which faces south-east or the roof of the extension which faces south-west. Electricity would be generated during the day though which wouldn't always reflect when the hall is used, however the Feed in Tariffs would provide an income for the hall after the initial payback. However the main constraint would be getting permission to install them.

Grants and Funding

There are various funding opportunities and grants available for community buildings such as Chirbury Village Hall. From local authority grants to Government incentives.

Local Authority Grants

These grants are continually changing as funding is allocated to different sectors. It can be a time consuming and complex process trying to gain funding. The Energy Saving Trust offers some informative advice on this subject http://www.energysavingtrust.org.uk/Communities/Finding-funding

Feed in Tariffs

Solar PV panels are eligible for the Feed-in Tariff (FIT). You get paid for every kWh of electricity that is produced plus further payment on 50% of electricity generated known as export tariff. At a current rate of 15.4p for every kWh generated providing the system is under 4 kilowatt peak output (4kWp). An additional payment of 4.6p/kWh is paid for every unit deemed to have been exported to the grid, normally assumed to be 50% of the output. Thus in total every kWh generated can be worth over 20p. Although the Feed in Tariffs have reduced considerably since the incentive was first introduced, so has the cost of the installation so can still give a good return on investment. The current tariff rates are due to drop by possibly 3.5% from the 1st July. The table below gives the current rates.

Total Installed Capacity (kW)	Import Tariff
<4kW	15.44p/kWh
>4-10kW	13.99p/kWh
>10-50kW	13.03/kWh
Export Tariff	4.64p/kWh (50%)

Renewable Heat Incentive

Chirbury Village Hall would be eligible to apply for the non-domestic element of the renewable heat incentive. Eligible technologies include solar thermal, ground source heat pumps and biomass boilers. This incentive is similar to the Feed in tariffs for Solar PV. You get paid per kWhth of useful heat produced. It does not offer a capital grant but gives payments based on the actual kWh produced by the biomass boiler. The table below gives an example of the costs of fuel based on a wood pellet boiler with the amount received from the RHI.

Boiler Rating kWth	**Mass of Pellets (estimated) per year**	**RHI received for the year**	**Pellet cost + domestic VAT at 5%**	**Pellet cost + business VAT at 20%**	**Annual equivalent oil cost saving**
8	**3.2 tonnes**	£ 927.41	£ 772.80	£ 883.20	£1,008.00
12	**4.8 tonnes**	£ 1,391.11	£ 1159.20	£ 1324.80	£1,512.00
15	**6 tonnes**	£ 1,738.89	£ 1449.00	£ 1656.00	£1,890.00
20	**8 tonnes**	£ 2,318.52	£ 1932.00	£ 2208.00	£2,520.00
25	**10 tonnes**	£ 2,898.15	£ 2415.00	£ 2760.00	£3,150.00
32	**12.8 tonnes**	£ 3,709.63	£ 3091.20	£ 3532.80	£4,032.00
36	**14.4 tonnes**	£ 4,173.34	£ 3477.60	£ 3974.40	£4,536.00
48	**19.2 tonnes**	£ 5,564.45	£ 4636.80	£ 5299.20	£6,048.00
56	**22.4 tonnes**	£ 6,491.86	£ 5409.60	£ 6182.40	£7,056.00

Green Deal

The Green Deal is the UK Government's new incentive to help people improve the energy efficiency of all buildings. The idea is that householders, businesses, landlords, community buildings, etc. make energy efficiency and heating improvements to their buildings at no up-front cost to themselves. The improvement work is carried out and then you pay off the cost in instalments through your electricity bill – it is essentially a loan on the property. It is a long term commitment, but this could suit a building such as the Memorial Hall well.

GREEN DEAL

Conclusion

There are many options available when it comes to increasing the energy efficiency of Chirbury Village Hall. However, as with all community halls this would come at high costs with relatively long pay back periods. When considering improving energy efficiency it would be wise to look at insulating the building first. Lower cost measures such as draught proofing should be priority, these can be done cheaply and are easy to install DIY and the benefits would be noticeable straight away. As there is no loft space, rafter insulation could be installed. Solid wall insulation (internal) would be a more expensive option with a very long payback period.

The payback period on insulation measures for building such as Chirbury Village Hall would be longer than in permanently occupied buildings because of the currently low occupancy levels and associated low energy bills. Ironically, the hall would need to use more energy in order to make further insulation measures financially viable.

There are several options when it comes to heating the hall, however there is the dilemma of installing heating that is cheaper to install but expensive to run – such as electric convector heaters – or installing heating that is cheaper to run but expensive to install (such as biomass-fired central heating). As Chirbury Village Hall is a classic 'hard to treat' property due to solid walls. There is no easy fix solution meaning the costs of energy efficiency measures. However, it would be worth looking into any grants for this that the hall may be eligible for.