Assessment Of Energy Saving Opportunities For

Bromborough Methodist Church

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EXECUTIVE SUMMARY

The Carbon Trust is grant funded by the Department for Environment, Food and Rural Affairs, the Department for Business, Enterprise and Regulatory Reform, the Scottish Government, the Welsh Assembly Government and Invest Northern Ireland.

This report presents the results of a CMEE (Carbon Management Energy Efficiency) site survey of the Methodist Church in Bromborough carried out by Malcolm Hanna of AECOM. The agreed objectives of the wider CMEE project is to undertake audits of 12 churches to identify energy saving opportunities and to produce a short, site specific report. The 12 reports are to be used to prepare a 'How To Guide' which will be distributed to all Methodist Churches to help them prioritise energy saving actions at their sites using real case examples.

Site visits were to concentrate on lighting, space heating, hot water as well as opportunities for changing people's behaviour. If a site is entitled to apply for the Carbon Trust Loans to assist in paying for installation of the measures recommended within the report then this will be indicated within the Action Plan (overleaf). For more information on the Carbon Trust Loan scheme, see http://www.carbontrust.co.uk/cut-carbon-reduce-costs/products-services/business-loans/pages/loans.aspx

If all the prioritised measures at this site are implemented, the aggregated savings from the measures identified represent an annual 32% reduction in energy consumption and a 28% reduction in cost or £564 which translates into direct cost savings.

ACTION PLAN

The recommendations listed below are prioritised, according to payback, with energy management the first priority.

Priority	Recommendations	Estimated annual savings			Estimated cost (£)	Payback period (years)	Timescale for implementation and by whom (to be completed by client)	May be eligible for Carbon Trust loan*
		(£)	CO_2 (tonnes)	(kWh)				
1	Improving management, monitoring and targeting of energy use – link to meter reading and bill checking	£146	0.89	3,828	0	Immediate		no
2	Switch off external lights at 10:00 rather than existing at 11 pm.	£10	0.1	139	0	Immediate		no
3	Replace old inefficient remaining tungsten lamps with compact fluorescent units	£40	0.3	619	£8	0.2		yes
4	Insulate pipes and valves in boiler room	£157	0.94	5,131	£200	1.3		yes
5	Replace Welcome Area spot lights with more energy efficient units on failure of existing lamps.	£13	0.1	202	£48	3.7		yes
6	Insulate the Church Hall roof area.	£90	0.54	2,948	£924	10		yes
7	Replace old inefficient fluorescent lighting (8 ft T12 units) with more energy efficient lamps and controls	£117	1	1,801	£1,700	14.5		yes
8	Insulate external walls to the Fellowship Room.	£3	0.17	95	£166	57		yes
TOTAL		**£564**	**4.04**	**14,763**	**£3,046.00**	**5.4**		

* Please refer to the Site Survey Publication for eligibility details or visit www.carbontrust.co.uk/loans

1. INTRODUCTION

1.1. Site details

Buildings and site

Bromborough Methodist Church was constructed in 1927, with the Church Hall added around 1930. The buildings have an internal floor area of 335m^2**.** The buildings comprise of the following elements;

- Welcome area
- Church
- Stewards office
- Ministers vestry
- Stage
- Male and Female WCS
- Church Hall
- Fellowship room
- Kitchen

There are no building refurbishments planned in the near future. The building is of brick construction and limited examination on site indicated the presence of cavity wall construction.
Most of the windows are single glazed. On the day of the visit work was being carried out in the Church Hall attic, which revealed that this attic area is currently uninsulated.

Space Heating
Space heating is provided for most areas by two Strebel S-HR51 (2 x 45 kW) gas condensing boilers, with a separate zone and time schedule control for the Church and Church Hall. Heating is delivered by a low pressure hot water system, with radiators and hot pipes delivering heat into the occupied spaces. The Fellowship room is heated by a direct acting Drugasar (10 kW, installed in 1984/85) gas heater, which is controlled by a new 7 day timer. There are a number of direct acting electric (tubular) radiant heaters in the building, with manual control. The church is also heated by 8no 5ft Expelair (3 kW 1977) radiant electric heaters, to supplement the low level heating pipes. The welcome area has two electric convector units (Sector 2kW each).

A review of the operating schedules against occupancy profile of the building indicated a reasonably close match e.g. heating in the church switched off 5 minutes before the end of the service and Church Hall heating switches on around 1 hour before first occupancy of the day and thirty minutes befor occupancy finishes.

Domestic Hot Water
DHWS are provided by local direct acting electric units (6 units). These are a combination of instantaneous over-sink units (3 Triton units – W.C. areas) and electric units including small hot

water reservoirs (3 kW Santon - kitchen, 2.8 kW Heatrae Sadia - kitchen, one other 6kW instantaneous unit in the kitchen.

Lighting – Internal
The majority of internal lighting is fluorescent, with a small number of tungsten lamps. All internal lights are manually switched

Lighting – External
External lighting is provided by a combination of 4no CFL units and a single 75W sodium light, which are currently switched off at 11pm. The lights are manually switched.

Energy and Environmental Management

Energy is purchased by the Treasurer and it is understood that this is part of a Circuit-wide arrangement. The energy bills are received and reviewed by the Treasurer. There is no monitoring or targeting of energy use carried out at present.

Responsibility for energy related matters will in most cases fall under the Property and Finance Committee, which both Property Stewards are members of. An annual report is provided to the Church Council (Treasurers Report) which details what has been done in the past year and what needs doing. This is a Treasurers report and is primarily for budgeting purposes.

The property HQ in Manchester was also mentioned as a source of support if needed.

Norman Green has previous energy management experience and has incorporated a number of energy efficiency measures into the operations on site. This has included the replacement of old tungsten lamps with more energy efficient compact fluorescent units (CFL). This has worked reasonably well, the only issue is that they have lost dimming capability in some areas. In particular Norman has been responsible for the heating system which incorporates high efficiency condensing boilers feeding a pressurised system incorporating a heat exchanger to overcome the possibility of system leaks in an older (gravity feed) system of this type. Norman has also taken responsibility for tight schedule control of the main heating system.

Maintenance
Maintenance arrangements are made locally.

Procurement
Procurement is generally dealt with locally at church level. The Circuit do have a list of people who can help.

2. ENERGY USAGE PROFILE

2.1. Site Energy Consumption and Spend

The site consumes approximately 46,341 kWh of energy per annum (based on 2008 - 2010 figures), costing a total of £2,001. All energy values are in terms of delivered energy.

This comprises

Utility	**Energy Consumption**		**Cost**		**CO_2 Emissions**
	kWh/year	**%**	**£/year**	**%**	**tCO_2**
Electricity (if used)	10,052	22	893	45	5.5
Gas (if used)	36,289	78	1,108	55	6.7
Total Energy	46,341		2,001		12.2

The unit costs for electricity and gas used in calculating savings are 7.17 and 3.054 p/kWh respectively (excluding VAT and standing charges where the data provided allows for this). These values are average costs (or state other source). The gas and electricity costs above include the Climate Change Levy. Carbon conversion factors used – Grid electricity (0.544 $kgCO_2$/kWh), Natural gas (0.184 $kgCO_2$/kWh)

3. CARBON REDUCTION OPPORTUNITIES

Priority no. 1	**Improving management, monitoring and targeting of energy use – link to meter reading and bill checking**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£146	0.89	3,828	0	Immediate
Detail	General good housekeeping approaches to managing energy can deliver energy savings of up to 15%. These should be underpinned by monitoring of energy use by a monthly review of actual (not estimated) use based on meter readings. Comparison with previous monthly use and eventually with historic data (same month last year) can provide insights into any exceptional use or progress made. An annual energy report could be provided to the Finance Committee to highlight progress made and future actions needed. The programme of good housekeeping could include; • Lights to be switched off when areas unoccupied or when daylighting permits • Regularly checking timers on boilers and heaters, checking of any lighting controls • Switching off of any other equipment such as catering equipment when not being used • Tighter control of heating systems – switching off of radiant heaters when not needed It is appreciated that the buildings are already quite tightly controlled by a relatively small group of people and therefore potential further savings are limited. However in general there should still be scope to improve, particularly as at present energy use is not monitored at all. A conservative view has been taken that savings of 5% should be achievable.			
Risks to business continuity	There are no significant risks but care should be taken when asking other building users to participate in a Good Housekeeping energy saving actions. Make sure that any sensitive equipment is carefully marked so that others do not tamper with settings. Also information should be circulated to ensure that people understand controls.			

Priority no. 2	**Switch off external lights at 10:00 rather than existing at 11 pm.**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£10	0.1	139	£0	Immediate
Detail	The external lights (4no CFL units and a single 75W sodium lamp) are currently left switched on until 11pm each night. It is proposed that they should be switched off at 10am each night in order to save energy.			
Risks to business continuity	May be security issues to be considered.			

Priority no. 3	**Replace old inefficient remaining tungsten lamps with compact fluorescent units**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£40	0.3	619	£8	0.2
Detail	During the survey 4 old type tungsten lamps were found around the building. It is recommended that these are all replaced with compact fluorescent lamps. These lamps will typically reduce the energy used by 75% and should last between 6 and 15 times longer than the existing lamps.			
Risks to business continuity	No risk. The cost to purchase these lamps is based upon the church buying them at £2 per lamp. However, it is recommended that a request is put out to congregation that if they have any 'spare' CFL bulbs at home they should be donated. The Energy Saving Trust has estimated that the average household has six unused bulbs lying in drawers that were sent out by the electricity supply companies to meet their Government Energy Efficiency scheme. If the congregation are not using theirs then maybe the church could.			

Priority no. 4	**Insulate pipes and valves in boiler room**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£157	0.94	5,131	£200	1.3
Detail	It was found during the visit that there is a significant amount of pipework and valves currently un-insulated in the boiler room area. Insulation has been purchased but not yet fitted due to time availability. It is recommended that this is carried out as soon as time is available.  Capital costs have been included above. In order to give a comparative view of this opportunity compared with others. It has been assumed that half a day of labour would be required for this task. However it is appreciated that much of the capital costs has already been met.			

Risks to business continuity	No significant risks. Health and safety considerations need to be understood by those carrying out this work.

Priority no. 5	**Replace Welcome Area spot lights with more energy efficient units on failure of existing lamps.**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£13	0.1	202	£48	3.7
Detail	The reception area is lit by 12 tungsten halogen spotlights (25W). These lamps are relatively inefficient and should be replaced by more efficient units. There are alternatives available including compact fluorescent and LED. Due to the intermittent use of this area (Estimate a maximum of 15 hours per week) it is recommended that a replacement on failure with 7 W of 11W compact fluorescent spotlights could be the best option. The above calculation is based upon a capital cost difference between the existing lamp and a CFL of £4/lamp. For LED lamps, currently costing between £10 and £20 each, the differential would mean longer paybacks and it is unlikely that the LED lamp life benefit (over 20,000 hours compared with 8,000 for the CFL) would make the difference.			
Risks to business continuity	No risks			

Priority no. 6	**Insulate the Church Hall roof area.**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£90	0.54	2,948	£924	10
Detail	The Church Hall roof is currently un-insulated. This was confirmed by contractors working in this area on the day of the visit. The Church Hall is heated and would benefit from insulation of the roof space where practically possible. It is therefore recommended that the roof is insulated with mineral and rock wool applied between wooden frame members and rafters. This has good thermal insulation properties and can be installed by a general builder, measuring and cutting skills are required to a depth of 150mm.			

	 The Carbon Trust guide CTL064, How to implement roof insulation indicates that up to 25% of the heat lost from a building's fabric is lost through the roof and that the application of insulation to un-insulated roofs can reduce this loss by up to 90%. For the purpose of this report we have utilised a figure of 45% as only a proportion of the existing roof area could be practically insulated.
Risks to business continuity	No significant risks

Priority no. 7	**Replace old inefficient fluorescent lighting (8 ft T12 units) with more energy efficient lamps and controls**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£117	1	1,801	£1,700	14.5
Detail	There are currently 9no 8ft T12 fluorescent lamps illuminating the Church Hall. These units are old and inefficient. The replacement lamps are no longer manufactured. It is recommended that these units are replaced with more energy efficient alternatives. In order to replace these units the whole fitting will need to be changed it is therefore recommended that while this is being carried out the most efficient units should be installed. The recommendation would be for high frequency T5 fittings, incorporating occupancy and daylight (lux) control as there is quite a lot of natural daylight in this area. It is recommended that these T8 fitting are replaced by twin 28W T5 units, 10 fittings in all. This would need to be confirmed by a lighting designer. The energy savings relate to the reduced control gear loses of the fittings, for the existing T12 units these are around 40%, for new high frequency units these are around 5-10%. The new fittings also provide the opportunity to reduce the rating of the installed units, from the existing 125W per fitting to 56W per fitting. Finally the inclusion of integrated controls for occupancy and daylight dimming offers potential savings of up to 40%. For this application it is assumed that daylight sensing and occupancy control could add a further 25% saving. The capital costs above are estimates and would require confirmation.			
Risks to business continuity	No risks, long payback due to relatively short operating hours of lighting.			

Priority no. 8	**Insulate the external walls to the Fellowship Room.**			
Cost Saving £/yr or £k/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £ or £k**	**Payback Years**
£3	0.17	95	£166	57
Detail	The external walls of the Fellowship are 11inch cavity walls and are currently un-insulated. This part of the building was constructed in 1961. It is recommended that these wall areas are insulated with insulating beads or granules blown into the wall cavity in order to reduce heat loss from this heated area. The Carbon Trust guide CTL062, How to implement cavity wall insulation indicates that Typically 10-30% of the heat lost from a building shell is lost through its wall and that the application of insulation to un-insulated walls can reduce this loss by this loss by around two-third. This was based upon the weekly heating period of 10 hours per week during the heating season. The above calculation assumes that during the heating season this room is heated for 10 hours per week.			
Risks to business continuity	The filling of cavity walls can potentially cause damp and water penetration problems to the external walls inner leaf and could aggravate existing thermal bridging problems. Therefore careful external and internal inspection of the existing structure and its current condition is required to determine the suitability of this opportunity. Remedial work such as re-pointing the brickwork may have to be incorporated into the scope of this opportunity.			

Additional Opportunities

In addition the following measures are recommended for further investigation by the site, but are not graded as a priority for action at the present time:

Item No	Description of Recommendation
1	Install photocell to control external lights (4 x 15W CFL plus 1 x 75W sodium)
2	Electric tubular (radiant heaters – 1977) 8 x 5ft 3kW – possibly replace with more efficient units or install black bulb thermostat.
3	Gas heater Fellowship area – 10 kW gets left on – 1984 (possibly more efficient)