Assessment Of Energy Saving Opportunities For

Norley Methodist Church

CONTENTS

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 Norley Methodist Church in Maddocks Hill carried out by Adam Fjaerem 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 could 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 a 23% reduction in energy consumption and a 24% reduction in cost or £356 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 the church)	May be eligible for loan*
		(£)	CO2 (tonnes)	(kWh)				
1	Replace all T12 lamps and luminaires	69	0.4	661	2,900	42		
2	Replace all existing tungsten GLS bulbs with CFL	19.50	0.10	187	20	1 year		
3	Insulate boiler pipe-work	11	0.6	329	5	< 1 year		
4	Install timer push button for electric heaters	10.50	0.05	100	60	5.8		
5	Outside flood light controls	14	0.07	135	100	7		
6	Remove two spot lights.	5	0	50	150	30		
7	Draught proof rear door	11	0.06	329	25	2		
8	Wireless controls for the heating circuits	108	0.6	3,291	320	3		
9	Replace boiler	108	0.6	3,291	5,000	46		
	Total	**356**	**2.48**	**8,373**	**8,580**	**24**		

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

1. INTRODUCTION

1.1. Site details

The Norely Methodist Church in Maddocks Hill, Cheshire was built in 1882 and consists of a single storey building with a pitched roof. The building is in an excellent state of repair and is well maintained. Recent improvements have included redecoration of the main worship hall and the installation of a disabled access ramp to the front entrance with improved car parking spaces. The building is mainly lit by T12 fluorescent tubes with some tungsten GLS lamps. Heating is provided by radiators with the main worship hall being on one heating circuit and the 'open door' room and 'back of house' area such as toilets, vestry, Sunday school etc being on a separate heating circuit. Each circuit has its own dedicated controller and thermostats.

The building is regularly used with services on alternative Sundays at 10:45 to 11:45 and 18:30 to 19:30 with coffee and tea served in the Open Door room between 11:45 to 12:30. An alternate worship is undertaken once a month at 09:00 – 10:00 and lunch is provided once a fortnight, mid-week, for elder members of the village. The building is used for private groups once a week, usually from 19:30 to 21:30 for such events as an open mic jam session and it is used occasionally during the day for other meetings of local groups such as Brownies, Circuit meetings and crafts groups.

For the purpose of the calculations in this report it will be assumed that the main worship building is open, lit and heated (during the heating season) for 10 hours per week every week (averaged over the year) and the Open Door Room is heated and lit for 15 hours per week every week (averaged over the year).

2. ENERGY USAGE PROFILE

2.1. Site Energy Consumption and Spend

The site consumes approximately 36,490kWh of energy per annum (based on 2009 figures), costing a total of £1,454. 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)	3,580	10%	373	26%	1.9
Gas (if used)	32,910	90%	1,081	74%	6.1
Total Energy	36,490	100%	1,454	100%	8

The unit costs for electricity and gas used in calculating savings are 10.42 and 3.284 p/kWh respectively (excluding VAT and standing charges where the data provided allows for this). These values are average costs. The gas and electricity costs above include the Climate Change Levy. Carbon conversion factors used are Grid electricity (0.544 $kgCO_2/kWh$) and Natural gas (0.184 $kgCO_2/kWh$)

3. CARBON REDUCTION OPPORTUNITIES

<table>
<tr><td>Priority no. 1</td><td colspan="4">Replace all T12 lamps and luminaires</td></tr>
<tr><td>Cost Saving
£/yr</td><td>CO_2 Savings
tonnes/yr</td><td>Energy Savings
kWh/year</td><td>Cost
£</td><td>Payback
Years</td></tr>
<tr><td>69</td><td>0.4</td><td>661</td><td>2,900</td><td>42</td></tr>
<tr><td>Detail</td><td colspan="4">The church is currently lit by a combination of T12 fluorescent tubes and tungsten bulbs as per the following table.
<table>
<tr><th>Location</th><th>Number of T12</th><th>Wattage</th></tr>
<tr><td>Main worship hall</td><td>6</td><td>100</td></tr>
<tr><td>Inner door cavity to Open door room</td><td>1</td><td>65</td></tr>
<tr><td>Open door room</td><td>4</td><td>100</td></tr>
<tr><td>Kitchen</td><td>1</td><td>65</td></tr>
<tr><td>Sunday school</td><td>2</td><td>65</td></tr>
<tr><td>Rear corridor</td><td>2</td><td>65</td></tr>
<tr><td>Cellar</td><td>1</td><td>40</td></tr>
</table>
It is recommended that each of these fittings is replaced with its T5 equivalent. T5 fluorescents give better quality light, for less energy consumption and have a longer life (approx 20,000 hours).

T5 equivalents of the 8ft, 100W, T12 fittings used in the ceiling of the main worship hall and the open door room are not manufactured. It is recommended that two 4ft, 28W T5 fittings are used to replace each of the existing units using the existing wiring circuits. These will produce the same, if not greater, light output than the existing arrangement.

All other T12 luminaires used in the church have a direct T5 replacement so a like-for-like replacement will be possible.

For the church a cheaper option may be to use T12/T8 to T5 conversion kit which incorporates a T5 luminaire on a high frequency batten which slots into the existing T12 luminaire. There are a number of different types of these available, however, it should be remember that the existing T12 luminaire is likely to be 20+ years old and whilst using this convertor will upgrade the lighting it is not a guarantee that the luminaire will not fail due to age. A complete replacement of luminaire is the only guarantee of this.</td></tr>
<tr><td>Risks</td><td colspan="4">In most buildings the replacement of T12 to T5 comes with a short payback period i.e. less than 4 years. However, in the church the hours of operation are so low that the payback is longer than desired. However, this needs to be weighed up against the fact that T12 fittings are now no longer legally available and their light life length is much shorter than that of the T5. Therefore, saving would be made in reduced replacement and the inherent cost associated with this replacement.</td></tr>
</table>

Priority no. 2	**Replace all existing tungsten GLS bulbs with CFL**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
19.50	0.10	187	20	1 year
Detail	There are a number of 60W and 100W GLS lights used throughout the church 4 x vestibule 1 x above front door 1 x store room 3 x disabled, male and female toilets 1 x vestry 1 x cellar It is recommended that these are replaced with CFL equivalents immediately as the savings that can be achieved mean that it is unnecessary to wait until the existing bulbs fail.			
Risks	No risk. The cost to purchase these lamps is based upon the church buying them. However, it is recommended that a request is put out to the 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 is not using theirs, the church could.			

Priority no. 3	**Insulate boiler pipe-work**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
11	0.6	329	5	< 1 year.
Detail	As can be seen from the photograph below there is a large amount of non-insulation pipework in the cellar. This pipework loses heat into the cellar where heat is not required, rather than sending the heat into the church (via the radiators) where it is desired.			

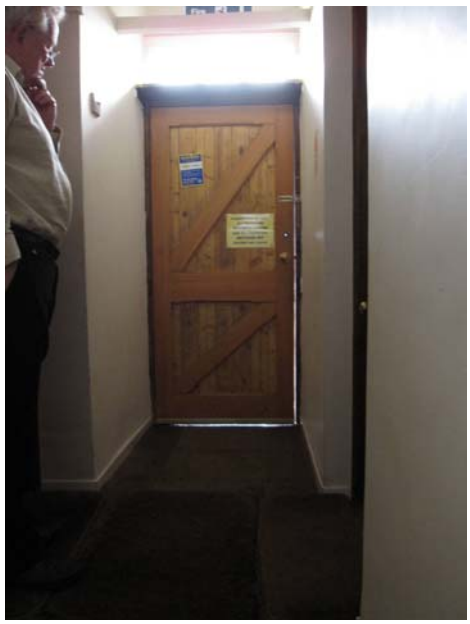
	 It is suggested by the Carbon Trust that 10-30% energy savings can be obtained by insulating pipework, however, for the limited pipe run available at Norley the savings figures above are calculated to 1%.
Risks	No risk

Priority no. 4	**Install timer push button for electric heaters**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
10.50	0.05	100	60	5.8
Detail	In the open door room electric heaters supplement the radiators to increase the temperature of the room quickly. However, it would be feasible for these to be accidently left on and subsequently using large amounts of electricity. Therefore, it is suggested that between the fused spur and the heater a timer push button is installed. This will allow the heater to operate for a set period (i.e. one hour) before stopping to avoid the unnecessary run on.			
Risks	No risk.			

Priority no. 5	Outside flood light controls			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
14	0.07	135	100	7
Detail	There are two flood lights on the front of the church that operate between dusk and 23:00 depending upon when dusk falls. The time clock controlling this is changed once a fortnight by the church steward depending upon the time of year. It is recommended that a daylight sensor (photocell) is installed between the time clock and the lights; this will allow the time clock to 'energise' between the standard times (i.e. 17:00 to 23:00) but the photocell will hold the flood lights off until it is sufficiently dark.			
Risks	No risk, as long as the daylight control is appropriately set.			

Priority no. 6	Remove two spot lights.			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
5	0	50	150	30
Detail	In the main worship hall there are four 250W spotlights that are used to provide light to the Reverend during services. It is assumed that these lights are purely to light the pulpit area to assist in reading and not for spot-lighting the speaker before the congregation. If this is the case a small, dedicated desk light on the pulpit would provide local lighting to aid reading at a much lower energy cost (and would provide more appropriate lighting).			
Risks	To avoid creating a trip hazard with a power cable trailing across the pulpit it is recommended that a floor mounted power socket is provided to plug this lamp in.			

Priority no. 7	Draught proof rear door			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
11	0.06	329	25	2
Detail	The open door room is reported as feeling cold, mainly from the back door and back passage area. As the photograph below shows this is likely to be because of the draughts coming through the back door.			

	 It is recommended that this door is draught proofed and if the draught still exists then a portiere (hinge door curtain) is installed.
Risks	No risk.

Priority no. 8	**Wireless controls for the heating circuits**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
108	0.6	3,291	320	3
Detail	Currently the controls for each heating circuit are located in the basement, if people require additional heating out of hours they need to go to the cellar and override the system for the duration of their meeting. This causes a number of issues. 1. The H&S implications of people going into the cellar 2. That the lighting in the cellar area and the cellar stairs can accidently be left on 3. It is possible that that the override may be forgotten about meaning that the boiler is left operating 4. People overriding the boiler controls may result in other settings being changed causing overrun or increased setpoints It is recommended that a wireless thermostat and controller is installed in the open door room and the main worship hall to control these different zones. Different models of controllers exist with different levels of complexity, but it is suggested that a unit is used that has the following criteria 1. Wireless range of at least 20m 2. Different times for weekdays and weekends 3. A visible temperature display 4. To be simple to override the system to increase the temperature of the room but will remove the override after a set period			

	5. To introduce optimum start to the heating system based on the amount of time it actually takes to get the building to temperature. This installation would solve all of the issues above; however, it would not prevent the current situation of alternate Sunday worship meaning, that the heating would still be active on those days when the worship was elsewhere. Unfortunately, to prevent this unnecessary activity the steward would need to reset the time periods each week.
Risks	No risk, indeed the use of this wireless technology would decrease the risk to persons working in the church. The savings above are based upon a 10% gas saving being achieved, the observed management routine make it difficult to give a more accurate saving.

Priority no. 9	**Replace boiler**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
108	0.6	3,291	5,000	46
Detail	The boiler at Norley is at least 15 years old and a newer one would be more efficient.  It is recommended that if money is available this is replaced, however, it is recognised that this would be expensive and difficult to justify the replacement of a unit that is currently in good working conditions on energy saving alone.			
Risks	No risk, the saving above is based on a 10% saving as per Carbon Trust guidance.			

Further Considerations:

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
Label light switch	Currently most people at Norley will not know which switch control has control of a particular light and so it is likely that people will turn all the switches on, therefore turning on more lights than necessary. If these switches were labelled then people may be more likely to only turn on the lights they need and therefore save energy (and extend light length). 
Insulate roof	The current radiator heating system means that warm air rises and is lost through the roof. Additional insulation would reduce this heat loss and help the building retain heat. The shape and height of the roof means that it would be difficult to insulate the edges of the roof space and this would reduce the effectiveness of the insulation. However, it may be viable to install starched bats of insulation that could be 'slotted' down the edges. It is recommended that an insulation company is invited to attend the site to give their opinion and more advice.