Assessment Of Energy Saving Opportunities For

Haygreen Methodist Church, Birmingham

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 Haygreen Methodist Church in Birmingham carried out by Oliver King 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 24% reduction in energy consumption and a 24% reduction in cost or £213 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	May be eligible for loan*
		(£)	CO2 (tonnes)	(kWh)				
1	Draught Proofing external doors - includes tightening door closing mechanisms	£0	0.0	0	£0	0.0	Implementation will depend on the Church's future occupancy	No
2	Replace inefficient lighting	£23	0.1	149	£282	12.2		Yes
3	Replace Church heaters with new electric fan convector heaters	£127	0.4	817	£1,690	13.3		Yes
4	Replace Church Hall heaters with new electric radiant heaters	£63	0.2	408	£1,690	26.7		Yes
		£213.00	**0.7**	**1374**	**£3,662.00**	**16**		

* Solar PV cost saving includes the potential benefit from Feed In Tariff

1. INTRODUCTION

1.1. Site details

The Church was built with help from the Bournville Trust and the land the Church and Hall are built on is still retained by the Trust. The Bourneville Trust has recently provided funding to help with renovations for double glazing. The church has ground linked to it that is currently an unused allotments and an Electricity Board substation which the church gains revenue from.

The Church building is a 1930's brick solid wall construction. The roof is a wooden trusses with a vaulted ceiling (~40o pitch) and no insulation. The windows in the main church and linked vestries are double glazed. The Church was estimated to have a floor area of 77m² and a 3 metre plus height ceiling.

The Church hall was constructed in 1961 and is a brick cavity wall construction. It is assumed this is unfilled as there is no recent drill marks in the mortar joints – they were unsure on site. It has a shallow pitched roof (~15o) with an open ceiling void. There is no insulation and the windows are double glazed. The Church Hall was estimated to have a floor area of 77m² and a 4 metre plus height ceiling.

Besides the Church and Church Hall, there is another vestry linking the Church. There is a kitchen plus five recently renovated toilets.

General condition is OK but there has been some movement in the main Church building exposing several crack which are than 5-10mm in width. The largest cracks have been filled. The subsidence occurred in the 1970's and there has been no recent movement. There a number of examples where exterior woodwork needs to be maintained. There is some damp in one of the back room toilets and there has recently been a burst water pipe in the back of the building. It was stated that there are sometimes leaks from the roof in the Church. There are some gaps between exterior doors allowing draughts to enter the building.

Heating
The Church is heated by electric filled radiators. There are six in the main Church, 4 large and 2 smaller. These are connected to 16amp fuses in the fuse box. It was not established when these were installed but they were in before 1963 and may have been installed as part of the original construction. These are controlled by a time clock and switches. Heating is switched on and then the time clock will begin heating the church at 06:00 on Sunday morning. The time clock is then set to switch them off at 13:00 but this rarely happens as they are usually switched off manually at the end of the service (12:00) at the latest. This system does generally provide enough heat although draughts do enter the back of the Church from the exterior doors.

The Church Hall is heated by 10no. Dimplez radiant heaters. These were connected to 32Amp fuses and are operated by switches in banks of two. The units look like they were installed in the 60's / 70's. These units are switched on when required for hall occupancy. The hall is used for dance

classes so heaters may not always be in operation. It is not sure how effective these heaters are and there are complaints that they do not warm ankles.

Point of use electric fan heaters are installed in the vestries and in the kitchen. These are used as required and have all been safety checked. These units provide adequate heat after a time

There has been talk about replacing the heating with a more effective system but this has not progressed any further.

Lighting
The Church has 6no. Main lamps. 2no. of these are CFL the rest our Tungsten lamps. The alter has recently had new spot lighting installed, these are 4no. halogen spots and there is one existing CFL spot.

Lighting in the Church hall is provided by 10no. CFL lamps. 2no. of these have been replaced with High Frequency controlled CFLs the remaining lamps are Low Frequency controlled CFLs.

Lighting in the toilets, Vestries and other common areas is provided by tungsten lamps with some CFLs. The kitchen utilises 1no. T12 fluorescent lamp.

Hot Water and Other use
Hot water was provided to the kitchen from an unknown source. The electric unit had a separate 32Amp fuse. Hot water for the toilets was provided by individual point of use heaters on a separate fuse. Kitchen has a kettle, hot water urn and microwave.

1.1.1. Church Operation

The Haygreen Church has a small congregation. This has decreased over recent years and there are a number of churches in the area. There is one service at 10:30 on Sunday for an hour and the church is usually emptied by 12:00. Once a month there is an evening group using the Church on a Sunday between 19:00 and 20:00, the church is empty be 20:30.

The Church hall is in use three days a week; Wednesday 19:00 - 20:00, Friday 16:00 – 19:00 and Saturday 11:00 – 15:00. The income from this hall helps to maintain the finances for the Church maintenance.

Cleaning is normally undertaken for an hour on a Friday, although this can change.

1.1.2. Energy Management

The site has Senior Steward responsible for the maintenance of the buildings. The treasurer is responsible for the budget for the electricity consumption and the maintenance for the buildings and is also a Circuit Steward on the Finance Committee. Over the past 5 months the Treasurer has been taking meter readings, these have been weekly since February, a summary of these readings is shown in the chart below.

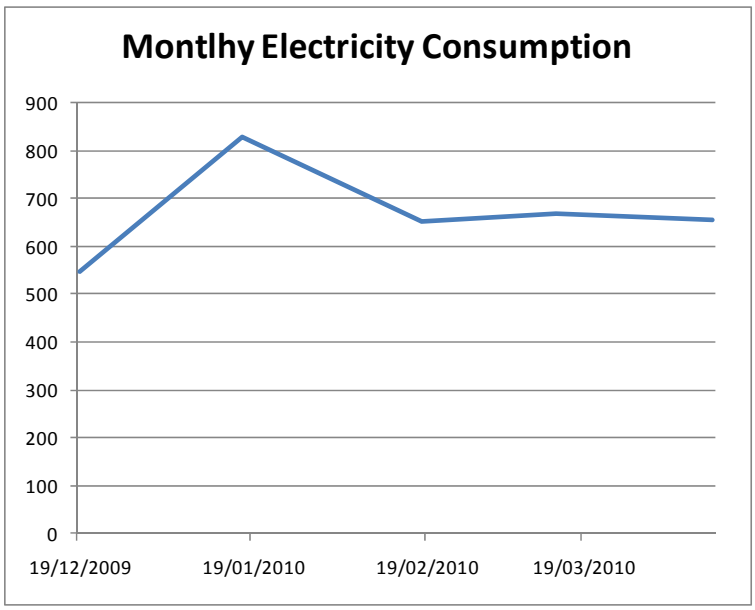


Chart 1 Monthly electricity consumption (kWh) plotted on a graph

2. ENERGY USAGE PROFILE

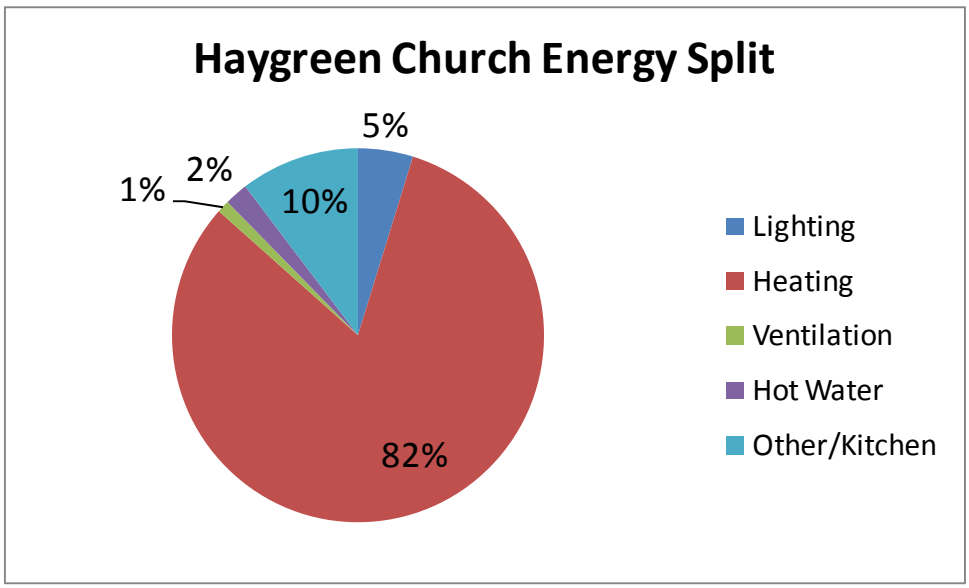
2.1. Site Energy Consumption and Spend

The Church is supplied by electricity from one main meter. The site consumes approximately 6,000 kWh of energy per annum (based on 2009 / 2010 figures), costing a total of £900. This information was calculated based upon meter reading and billing information, the cost figure has been calculated based upon the current electricity tariff. All energy values are in terms of delivered energy.

This comprises

Utility	Energy Consumption		Carbon Dioxide		Cost	
	kWh/year	%	tCO_2	%	£/year	%
Electricity	5,690	100%	3	100%	£882	100%
Total Energy	5,690		3		£882	

The unit cost for electricity used in calculating savings is 15.5p/kWh (excluding VAT and standing charges where the data provided allows for this). The gas and electricity costs above include the Climate Change Levy. Carbon conversion factors used – Grid electricity (0.544 $kgCO_2$/kWh), Natural gas (0.1874 $kgCO_2$/kWh).



3. CARBON REDUCTION OPPORTUNITIES

This section outlines in more detail the opportunities to reduce energy consumption and carbon dioxide emissions. The Church has a low energy demand and low occupancy which means that most of the opportunities to invest in energy saving technologies have longer payback then would normally be expected. It is understood that the congregation of Haygreen Church are not specifically considering energy saving investment at this point.

Priority no. 1	**Draught Proofing external doors - includes tightening door closing mechanisms**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£0	0.0	0	£0	0.0
Detail	The site survey revealed that the external doors of the Church and Church Hall allow external air to ingress into the building. These doors should be checked to ensure that door closing mechanisms are sufficiently tight to stop the wind being able to blow the doors open and they should also have draught stripping installed to reduce draughts. Check and tighten door closing mechanisms and undertake the installation of draught stripping. This opportunity may not save any energy costs (due to heating types) but it will help to improve the building user comforts. No cost is quoted as it is hoped that a member of the congregation or wider parish could assist in undertaking this option.			
Risks	No risks			

Priority no. 2	**Replace inefficient lighting**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£23	0.1	149	£282	12.2
Detail	The Church has 6no. Main lamps. 2no. of these are low energy compact fluorescent lamps (CFL) the rest are Tungsten lamps. The alter has recently had new spot lighting installed, these are 4no. halogen spots and there is one existing CFL spot. Lighting in the Church hall is provided by 10no. CFL lamps. 2no. of these have been replaced with High Frequency controlled CFLs the remaining lamps are Low Frequency controlled CFLs. Lighting in the toilets, Vestries and other common areas is provided by tungsten lamps with some CFLs. The kitchen utilises 1no. T12 fluorescent lamp.			


LF CFL


Tungsten Lamp


T12 Fluorescent

Replace as stated below.

Area	Current		Energy Efficient Replacement	
	Lamp type	Watt (W)	Lamp type	Watt (W)
Church	Tungsten	60	CFL	11
Church	CFL	11	CFL	11
Church Alter	Halogen	50	Halogen ES	35
Church Alter	CFL	11	CFL	11
Church Hall	LF CFL	18	HF CFL	18
Church Hall	HF CFL	18	HF CFL	18
Toilets	Tungsten	60	CFL	11
Vestry no.1	CFL	11	CFL	11
Kitchen	T12	80	T5	28

Notes:

- Halogen ES – Halogen Energy Saver
- LF/HF CFL – Low/High Frequency Compact Fluorescent
- T5 – High efficiency T5 Fluorescent lamp

Risks	CTL027 – How to implement office lighting refurbishment CTG010 - Display lighting; Creating maximum impact with minimal energy consumption

Priority no. 3	**Replace Church heaters with new electric fan convectors heaters**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£127	0.4	817	£1,690	13.3
Detail	The site survey revealed that the current electric heaters are the main energy consuming equipment on site. These heaters are simple electric elements in cast iron tubes filled with a fluid to aid heat transfer. These were installed pre 1963. These should be changed for more effective electric system that utilises electric heating elements and fans to distribute heat into the occupied area of the church. The saving has been calculated by comparing four new installed electric fan heaters and disabling or removing the current electric tubular radiators. It is assumed that the new system will be utilised over the same period as the current equipment.			

	   Filled electric radiator Heating controls, switches and thermostat Assign a contractor to quote to undertake the installation of new heaters. Ask contractor to provide estimated energy consumption for the current hours of use. Use the above information to apply for Carbon Trust funding and other local funding.
Risks	No risk to site. Installing wall mounted system will reduce the space for storage of chairs – wall mounted heaters must be left free from obstruction to provide the heat required. Electric fan heaters will require regular maintenance.

Priority no. 4	**Replace Church Hall heaters with new electric radiant heaters**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£63	0.2	408	£1,690	26.7
Detail	The site survey revealed that the current electric radiant heaters in the Church Hall are not adequate and are very old. They provide heat to the tops of occupant's heads but not manage to heat at floor level. These should be changed for more efficient new electric heaters.    The hall is used a few times a week for community events and for dance classes. The hall size means that it will always be difficult to heat. The heating is not always used but when it is it is found not to be adequate. A new heating system could utilise new radiant heaters but the ceiling height and installation and maintenance costs mean that wall mounted units producing heat at floor level should cheaper and more useful into the future. The saving has been calculated by comparing four new installed electric fan heaters and disabling or removing the current ceiling mounted radiant heaters.			

	It is assumed that the new system will be utilised over the same period as the current equipment. Assign a contractor to quote to undertake the installation of new heaters. Ask contractor to provide estimated energy consumption for the current hours of use. Use the above information to apply for Carbon Trust funding and other local funding.
Risks	No risk to site. Installing wall mounted system will reduce the space for storage of chairs – wall mounted heaters must be left free from obstruction to provide the heat required. Electric fan heaters will require regular maintenance.

Longer Term Energy Saving Opportunities

In addition to addressing the main energy consumption of the church and church hall there are two options to reduce energy consumption into the future.

Priority no. I	**Investigate Building Insulation**			
Cost Saving £/yr	**CO_2 Savings tonnes/yr**	**Energy Savings kWh/year**	**Cost £**	**Payback Years**
£0	0	0	~£2,500 - £5,000	None
Detail	The Church building is a 1930's brick solid wall construction. The roof is a wooden trusses with a vaulted ceiling (~40o pitch) and no insulation. The Church hall was constructed in 1961 and is a brick cavity wall construction. It is assumed this is unfilled as there is no recent drill marks in the mortar joints – they were unsure on site. It has a shallow pitched roof (~15o) with an open ceiling void. The windows in the main church, linked vestries and church hall are double glazed. The building could be insulated with solid wall insulation in the main church and cavity wall insulation in the church hall walls. In addition options for insulation of the ceilings/could be considered. No energy saving has been given as the limited use of the Church means that the current heating systems are likely to be used in the same way providing greater comfort for the occupants. The cost is indicative and quotations should be sought from contractors. (CTV014) Building fabric technology overview			
Risks	There are some areas of damp in the rear areas, the Kitchen and toilet areas. An investigation into the cause of this damp should be undertaken before solid wall insulation is applied.			

<table>
<tr><td>Priority no. II</td><td colspan="4">Install a Solar Photovoltaic Panel</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>£783</td><td>1.1</td><td>2,000</td><td>£12,500</td><td>16</td></tr>
<tr><td>Detail</td><td colspan="4">A longer term project to be considered is the installation of Solar Photovoltaic panels on the Church and Church Hall roof. There panels will generate electricity from sunlight This project could be undertaken to offset the impact of the electricity generation on site.

The installation of Solar PV panels is expensive and is recommended as a longer term opportunity. The cost saving listed above here is based upon the Church receiving a Feed in Tariff for the electricity generated from the system. The Church would receive the direct benefit from avoided electricity costs from generated energy as well as the benefit from the Generation Tariff and Exported Tariff.

Feed in Tariff
The Department of Energy and Climate Change (DEC) have instigated the Renewable Electricity Financial Incentives programme or Feed-in-Tariffs. This programme is designed to stimulate the uptake of small and medium renewable electricity generation. The key financial elements of the proposed approach are:

• An Generation Tariff – a payment for every kWh generated whether exported or used onsite
• An Export Tariff - an additional payment for every kWh exported.
• The ‘Avoided Costs’ - a saving from the use of generated electricity on site

<table>
<tr><td></td><td>kWh</td><td>tariff</td><td>Total</td></tr>
<tr><td>Generated</td><td>2,000</td><td>0.31</td><td>£620</td></tr>
<tr><td>Exported</td><td>1400</td><td>0.05</td><td>£70</td></tr>
<tr><td>Avoided</td><td>600*</td><td>0.155</td><td>£93</td></tr>
<tr><td></td><td></td><td></td><td>£783</td></tr>
</table>
* Estimate of the energy generated and used by the church directly.</td></tr>
<tr><td>Risks</td><td colspan="4">There are no risks but this opportunity does require a longer term plan for the church to regain the benefit of the investment and from the Feed in Tariff. This may be outside of the Haygreen Church’s reach.</td></tr>
</table>