Energy Audit and Survey Report

St Simon and St Jude's Church, Milton under Wychwood

"There is a plan to reduce global carbon emissions to net zero by 2050. The plan will work. It involves all of us. We need to begin now, in our homes and workplaces and churches"

Revd Dr Stephen Croft, Bishop of Oxford

Version Control

Author	Reviewer	Date	Version
Matt Fulford	David Legge	14th April 2020	1.0

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1. Executive Summary

An energy survey of St Simon and St Jude's Church, Milton under Wychwood was undertaken by Inspired Efficiency Ltd to provide advice to the church on how it can be more energy efficient and provide a sustainable and comfortable environment to support its continued use.

St Simon and St Jude's Church, Milton under Wychwood is Grade II listed parish church dating back to 1854 with a separate parish room building built in 1993. There is only electricity supplied to the site which is one supply feeding both buildings.

The church has a number of ways in which is can be more energy efficient. Our key recommendations have been summarised in the table below and are described in more detail later in this report. It is recommended that this table is used as the action plan for the church in implementing these recommendations over the coming years.

Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Payback	Permission needed	CO2 saving (tonnes of CO2e/year)
Contact supplier to arrange for the meter to be changed to a smart meter	None	None	Nil	N/A	None	N/A
Switch electricity supplier to one which provide 100% renewable supplies	None	None	Nil	N/A	None	Offset 8.98 tonnes of emissions[1]
Change existing lighting for low energy lamps/fittings	1,106	£166	£2,475	14.94	List B	0.34
Install PIR motion sensors on selected lighting circuits in parish rooms	100	£15	£312	20.85	List A	0.03
Fit 270mm of insulation into the loft of the parish rooms	1,571	£235	£800	3.40	List B	0.48
Fit draft proofing to historic doors	112	£17	£800	47.58	List B	0.03
Switch to use of air source heat pump to parish rooms	10,996	£1,646	£20,000	12.15	Faculty	3.38
Check and install cavity wall insulation to parish rooms	1,257	£188	£800	4.25	List B	0.39
Consider small (4kWp) PV array on south lady chapel roof	3,400	£509	£5,500	10.81	Faculty	1.04

[1] This church is entirely electric and therefore purchasing its electricity from a 100% renewable supply will allow for all of its carbon emissions to be effective offset from renewable energy generation as such this would be a hugely positive first step but should not be seen as a substitute for achieving reduced use of energy.

The Church should check any faculty requirements with the DAC Secretary at the Diocese before commencing any works.

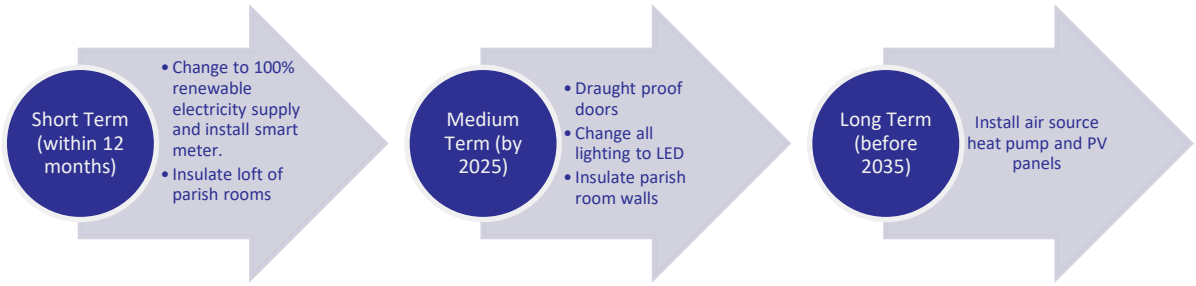
Based on current contracted prices of 14.97p/kWh for electricity.

If all measures were implemented this would save the church £2,776 per year.

2. The Route to Net Zero Carbon

The General Synod of the Church of England has indicated that the Church of England should be Net Zero Carbon by 2030, and is counting in its approach to net zero each church, cathedral, voluntary aided or diocesan MAT church school, and vicarage. The Diocese of Oxford has also declared a climate emergency and has an ambition to be carbon neutral by 2035.

This church has a clear route to become net zero by 2035 by undertaking the following steps:



3. Introduction

This report is provided to the PCC of St Simon and St Jude's Church, Milton under Wychwood to provide them with advice and guidance as to how the church can be improved to be more energy efficient. In doing so the church will also become more cost effective to run and seek to improve the levels of comfort. Where future church development and reordering plans are known, the recommendations in this report have been aligned with them.

An energy survey of the St Simon and St Jude's Church, Milton under Wychwood, was completed on the 23rd March 2020 by Matt Fulford. Matt is a highly experienced energy auditor with over 15 years' experience in sustainability and energy matters in the built environment. He is a chartered surveyor with RICS and a CIBSE Low Carbon Energy Assessor. He is a Member of the DAC in the Diocese of Gloucester and advises hundreds of churches on energy matters.

St Simon and St Jude's Church, Milton under Wychwood	627085
Gross Internal Floor Area	401 m^2
Listed Status	Grade II
Typical Congregation Size	30

The church typically used for 3 hours per week for the following activities

Services	2 hours per week
Meetings and Church Groups	1 hours per week

There is additional usage over and above these times for festivals, weddings, funerals and the like.

The parish rooms in used much more extensively with coffee mornings and the parish administrator using the building on a daily basis.

4. Energy Procurement Review

Energy bills for electricity have been supplied by St Simon and St Jude's Church, Milton under Wychwood and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	15.363p/kWh	In line with current market rates
Night Rate	13.121p/kWh	In line with current market rates
Standing Charge	£21.27/quarter	N/A

The above review has highlighted that the current rates being paid are in line or below current market levels and the organisation can be confident it is receiving good rates and should continue with their current procurement practices. We would recommend that the church obtains a quotation for its electricity supplies from the Diocese Supported parish buying scheme, http://www.parishbuying.org.uk/energy-basket. This scheme only offers 100% renewable energy sourced energy and therefore it is an important part of the process of making churches more sustainable.

A review has also been carried out of the taxation and other levies which are being applied to the bills. These are:

VAT	5%	The correct VAT rate is being applied.
CCL	Not charged	The correct CCL rate is being applied.
FiT	100% charged	A FiT charge is being applied. It should be checked that this is being charged in accordance with the supply contract.

The above review confirmed that the correct taxation and levy rates are being charged.

5. Energy Usage Details

St Simon and St Jude's Church, Milton under Wychwood uses 29,242kWh/year of electricity, costing in the region of £4,378 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Simon and St Jude's Church, Milton under Wychwood has one main electricity meter, serial number K95R42886, this serves both the church and the parish rooms.

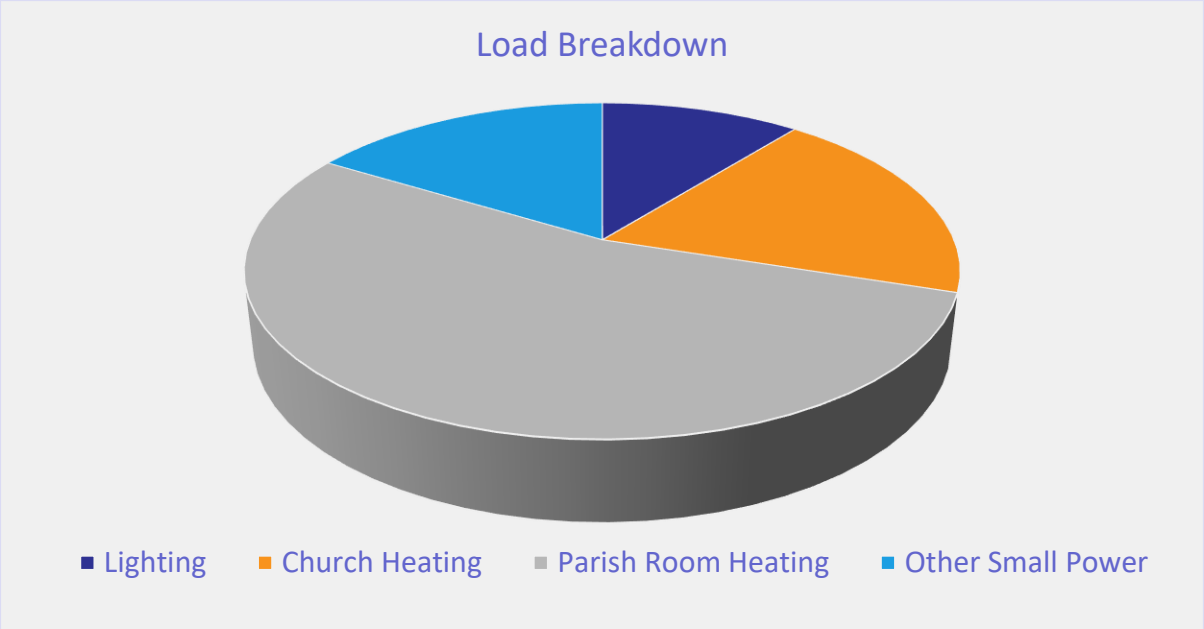
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church and Parish Rooms	K95R42886	3 phase 100A	No – 2 Rate Dial Meter	Vestry

The meter is an old 2 rate dial meter and it is recommended that the church consider asking their suppliers to install smart meters so that the usage can be monitored more closely and the patterns of usage reviewed against the times the building is used.

5.1 Energy Profiling

The main energy use within the church can be summarised as follows:

Service	Description	Estimated Proportion of Usage
Lighting	Mainly compact fluorescent spots within the church with some flood lights. 2D fluorescent fittings in parish rooms with one fluorescent tube in the kitchen.	11%
Heating	Electric panel heaters mounted on rear of pews within the church.	19%
Storage heaters in parish rooms	Electric night storage heaters within the parish rooms.	54%
Other Small Power	Office equipment, kitchen appliances, organ, alarms and the like.	16%



As can been seen from this data, the night storage heating to the parish rooms makes up by far the largest proportion of the energy usage on site.

5.2 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Simon and St Jude's Church, Milton under Wychwood uses 57.1% less energy than would be expected for a church of this size.

	Size (m^2 GIA)	St Simon and St Jude's Church, Milton under Wychwood use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Simon and St Jude's Church, Milton under Wychwood (elec)	401	72.92	20	10	N/A
St Simon and St Jude's Church, Milton under Wychwood (heating fuel)	401	0.00	150	80	N/A
TOTAL	401	72.92	170	90	-57%

6. Energy Saving Recommendations

6.1 Lighting (fittings)

The lighting makes up a relatively small overall energy load within the building, and most areas are lit by fairly efficient fittings. The downlights in many areas are high output compact fluorescent lamps. Replacement LED lamps for these are widely available on the market and it is suggested that lamp (not the entire fitting) is replaced.

The high energy flood lights to the chancel and clearstory should be replaced for new LED flood lights. Within the parish rooms the fluorescent tube within the kitchen area should be replaced with a new LED fitting and the existing 2D fittings in the rest of the building would also benefit from being replaced with new LED fittings.

If all the lights were changed the total capital cost (supplied and fitted) would be £2,475. The annual cost saving would be £166 resulting in a payback of around 15 years. Many of the lights could be self-installed and therefore cost much less than the supply and fit cost above. In this case the £150 grant available through this process could be very usefully employed to fund the purchase of replacement LED lamps which the church installs themselves.

6.2 Lighting (control for internal lights)

The light within the kitchenette of the parish rooms is only used occasionally and for a short amount of time and as such, the light does not need to remain on constantly. It is therefore recommended that a motion sensor is installed on this specific lighting circuits so that the lights come on only when movement is detected in the space and turn off approximately two minutes after the last movement has been detected (note that the duration of the time lag after which the light goes off needs to be consider alongside the type of light that is fitted. LED lights are much more suited to being switched off after only a short duration than some fluorescent lights). These movement sensors (commonly called PIRs) also have light sensors integrated into them so they can be used to make sure that the light does not come on if there is already sufficient daylight in the space.

Your existing electrician or any NICEIC registered electrical contractor can install PIR sensors onto existing lighting circuits. This can be carried out without significant disruption to the use of the space.

6.3 Roof Insulation

The loft void above the ceiling to the parish rooms was not inspected as part of this audit but if found to have little (100mm of lower) or no insulation present it is recommended that insulation be added to prevent heat loss and create a more comfortable environment for the occupants of the building.

The ceiling/roof of a building is the largest contributing area to heat loss from a building as heat rises. The insulation of such spaces can therefore have a dramatic impact on both the efficiency of the heating system and the temperature of the space below. Insulation measures such as this also need to be combined with control measures such as TRV's or room sensors to ensure that the space does not overheat because of the additional insulation.

A free survey and quotation for the supply and installation of insulation to the loft spaces can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 9309689, adrian@esos-energy.com).

6.4 Wall Insulation

The parish rooms are constructed with a cavity wall method and the inspection of the wall showed no signs that insulation has been added. Prior to the early 1990's cavity walls did not require to be insulated and therefore it is possible (being building in 1993) that there is no insulation present but it could be added through injecting it into the cavity walls.

It is recommended that cavity wall insulation is considered and added to the walls where appropriate. A survey to check the width of the cavity, exposure of the wall and condition of the cavity should be carried out by a CIGA approved installer who will then be able to provide you with a quotation to undertake the works. Installing cavity wall insulation will help to reduce heat loss and improve the comfort of the space,

A free survey and quotation for the supply and installation of insulation to the loft spaces can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 9309689, adrian@esos-energy.com).

6.5 Draughtproof External Doors

There are a number of external doors in the church. These have the original historic timber doors on them, but these do not close tightly against the stone surround and hence a large amount of cold air is coming into the church around the side and base of these doors. It was noted that the north door to the nave as a rotten timber weather board externally on the cill of the door and this would

benefit from replacement to avoid the large air gap under the door.

It is recommended that draught proofing is fitted to all external doors. A product called QuattroSeal (see link below) is often used in heritage environments to provide appropriate draught proofing.
http://www.theenergysavers.co.uk/application/files/1714/7197/4194/National_Trust_Case_Study.pdf

7. Church Heating Improvements

Under Pew Heaters

Given the churches usage profile, the use of pew heaters is considered to be the most efficient way of providing thermal comfort to the congregation. The existing pew heaters are reported to be only moderately effective and are supplemented by high level infra-red heaters which emit an unpleasant red glow. The effectiveness of the pew heaters is likely to be due to their age and style.

If the church needs to replace or wishes to improve the pew heating it would be recommended that they opt to replace the existing pew heaters with underpew heaters. The two most popular under pew heaters within churches are BN Thermic PH30 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating. Cable runs which serve the existing pew heaters could be reused.

The recommended solution of underpew heaters can be seen at St Andrews Church, Chedworth, GL54 4AD which is pictured below.

8. Renewable Energy Potential

The potential for the generation of renewable energy on site has been reviewed and the viability noted.

Renewable Energy Type	Viable
Solar PV	Yes – to south facing, mainly hidden roof, of lady chapel
Battery Storage	Yes – small system alongside above PV
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Ground Source Heat Pump	No – archaeology in ground and radiator system required.
Air Source Heat Pump	Yes – would be a suitable solution to the parish rooms
Biomass	No – not enough heating load as well as air quality issues

There is potential for a small PV array on the roof of the lady chapel. The current arrangements around solar panels mean that to be financially viable, the building on which they are mounted needs to consume the vast majority of the energy that they produce. The churches energy consumption is already very small but there is a notable demand from the parish rooms which uses the same electricity supply. Therefore, a small array located on the roof of the lady chapel would serve a useful purpose. This only needs to be around a 4kWp array of around 12 panels (or whatever number can be fitted on this roof).

Battery Storage is not strictly a renewable energy solution, but battery storage does however provide a means of storing energy generated from solar PV on site to be able to be used at peak times or later into the day when the PV is no longer generating. It therefore extends the usefulness of the existing PV system particularly in this sort of church. Any generation in the afternoons (when the parish rooms are not used so much) could therefore be stored for lighting in the evenings etc.

The night storage heaters to the parish rooms are relatively energy intensive for the use, and the nature of the night storage heaters means there is a lot of electricity input for less useful heat as the controllability of the timing is difficult with this method of heating. Once the building has been fully insulated, it is of a useful size and thermal quality to be able to successfully heater by an air source heat pump which could be located externally against the wall of the building. This would provide more instant heat into the rooms when it is required and provide around 3 units of heat output for 1 unit of electricity input and is therefore inherently more energy efficient than the current method of heating.

9. Funding Sources

This audit programme offers each participating church the chance to apply for a grant of up to £150 towards implementing some of the audit's recommendations. An application form is included with this report.

There are a variety of charitable grants for churches undertaking works and a comprehensive list of available grants is available at https://www.parishresources.org.uk/wp-content/uploads/Charitable-Grants-for-Churches-Jan-2019.pdf .

Trust for Oxfordshire's Environment (TOE) does have some funds available (over and above the small implementation grants of £150 available through this scheme) to support energy efficiency improvements in community facilities. If your church is used by the wider community, visit www.trustforoxfordshire.org.uk or contact admin@trustforoxfordshire.org.uk to find out if your project is eligible for a grant of up to about £5,000.

10. Faculty Requirements

It must be noted that all works intended to be undertaken should be discussed with the DAC at the Diocese.

Throughout this report we have indicated our view on what category of permission may be needed to undertake the work. This is for guidance only and must be checked prior to proceeding as views of different DACs can differ.

Under the new faculty rules;

List A is for more minor work which can be undertaken without the need for consultation and would include changing of light bulbs within existing fittings, repair and maintenance works to heating and electrical systems and repairs to the building which do not affect the historic fabric.

List B is for works which can be undertaken without a faculty but must be consulted on with permission sought from the Archdeacon through the DAC. This includes works of adaptation (but not substantial addition or replacement) of heating and electrical systems and also the replacement of existing boilers so long at the same pipe work, fuel source and flues are used. It can also be used to replace heating controls.

All other works will be subject to a full faculty.

Works which affect the external appearance of the church will also require planning permission (but not listed building consent) from the local authority and this will be required for items such as PV installations.

Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

Room/Location	Number of Fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
Vestry	1	LED GLS	£0.27	£10.50	39.03
Chancel	2	50W LED Flood	£5.79	£182.60	31.53
Chancel	6	LED GLS	£2.89	£63.00	21.78
Nave	18	LED GLS	£8.68	£189.00	21.78
Nave	8	50W LED Flood	£23.17	£730.40	31.53
South Aisle	8	LED GLS	£3.86	£84.00	21.78
North Aisle	7	LED GLS	£3.37	£73.50	21.78
Parish Rooms	15	2D LED 11W	£102.66	£818.25	7.97
Parish Rooms Kitchen	1	5ft Single LED	£14.93	£93.70	6.28