



Energy Audit and Survey Report
St Michael and All Angels Church
Diocese of Oxford



"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
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1. Executive Summary

An energy survey of St Michael and All Angels Church 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 Michael and All Angels Church is a Grade I listed parish church located in the village of Blewbury. The church is Norman with substantial 15th Century and Victorian additions. There is only electricity supplied to the site.

The church has a number of ways in which it 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.

Medium Term: Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Simple Payback (years)	Permission needed	To be actioned by who / when?
Adjust storage heater times to match Economy 7 times	None	Dependent on E7 tariff	None	-	None	
Fit Quattro seal draft proofing to historic doors	676	£77	£800	10.39	List B	
Change existing lighting for low energy lamps/fittings	641	£73	£1,144	15.67	List B	

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

Based on current contracted prices of 11.39p/kWh for electricity (blended rate).

If all measures were implemented this would save the church £150 per year.



2. Introduction

This report is provided to the PCC of St Michael and All Angels Church 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.

St Michael and All Angels Church is a Grade I listed parish church located in the village of Blewbury. The church is Norman with substantial additions throughout the C12 to C15 and during the Victorian era. There is only electricity supplied to the site.

An energy survey of the St Michael and All Angels Church, Church End, Blewbury, Didcot OX11 9QH was completed on the 4th April 2019 by David Legge. David is an experienced energy auditor with over 10 years' experience in sustainability and energy matters in the built environment. David is a fully qualified ESOS lead assessor with CIBSE and a CIBSE Low Carbon Consultant and a fully qualified ISO50001 lead auditor.

St Michael and All Angels Church	
Gross Internal Floor Area	405 m ²
Listed Status	Grade I
Typical Congregation Size	40-50

The church typically used for 5 hours per week for the following activities

Services	3 hours per week
Meetings and Church Groups	2 hours per week
Community Use	Ad hoc use

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



3. Energy Procurement Review

Energy bills for electricity have been supplied by St Michael and All Angels Church and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	13.8463 p/kWh	Above current market rates
Night Rate	12.0292 p/kWh	Above current market rates
Standing Charge	27.1452 p/day	N/A

The above review has highlighted that there are opportunities to gain cost savings from improved procurement of the energy supplies at this site. We would therefore 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.

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



4. Energy Usage Details

St Michael and All Angels Church uses 35,097 kWh/year of electricity, costing in the region of £3,996 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site (see Appendix 2). St Michael and All Angels Church has one main electricity meter, serial number E14UP04856.



Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	E14UP04856	3 phase 100A	Yes, but no AMR connectivity	South of Nave in wall cupboard

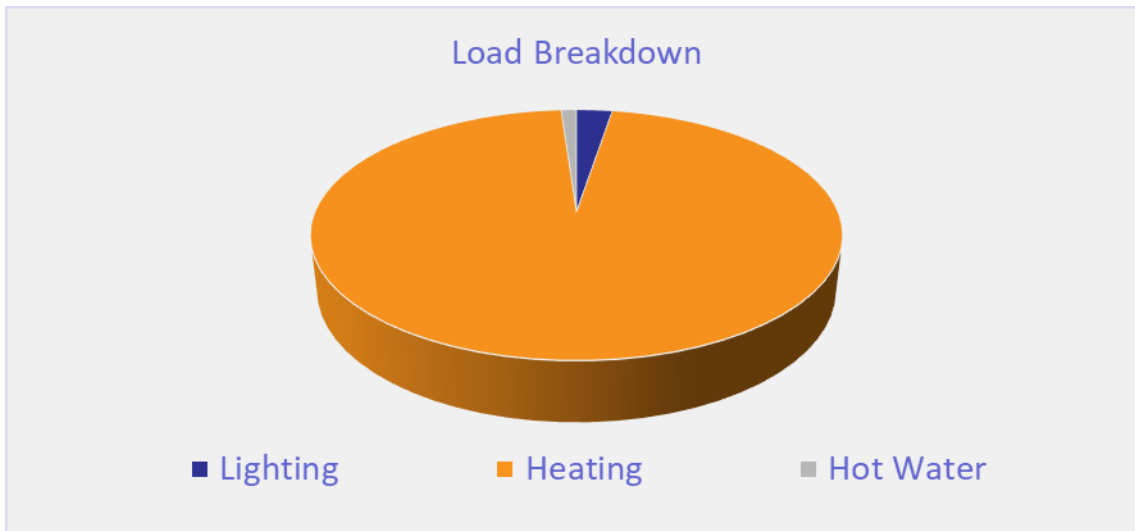
It is recommended that the church consider asking their suppliers to install smart meters so that the usage can be monitored more closely and the patterns of usage reviewed against the times the building is used.



4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	A variety of lighting including efficient LED lamps within main nave chandeliers and spot lights through to inefficient halogen spot lights throughout the church	3%
Heating	Background heating provided by 4 electric night storage heaters supplemented by 12 radiant heaters located 5m above floor level.	96%
Hot Water	Over sink Heatrae Sadia electric point of use in kitchenette	1%



As can be seen from this data, the heating makes up by far the largest proportion of the energy usage on site.



4.2 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Michael and All Angels Church uses 49% less electricity than would be expected for a church of this size, as the combined benchmark is the only true reflection of energy use at the church. This is likely to reflect the hours of use more than the efficiency of the heating and lighting.

	Size (m ² GIA)	St Michael and All Angels Church use kWh/m ²	Typical Church use kWh/m ²	Efficient Church Use kWh/m ²	Variance from Typical
St Michael and All Angels Church (elec)	405	86.76	20	10	334%
St Michael and All Angels Church (heating fuel)	405	0	150	80	n/a
TOTAL	405	86.76	170	100	-49%



5. Energy Saving Recommendations

5.1 Lighting (fittings)

The lighting makes up a relatively small overall energy load within the building, and large areas are lit by efficient LED fittings within the nave including the candle lamps within the chandeliers and the spot and flood lights.



However, there still remains a large number of inefficient halogen spot lights within the church, which can be replaced with LED equivalents that are widely available on the market. For the spot lights the Megaman range of LED spot (reflector) lights <https://www.megamanuk.com/products/led-lamps/reflector/> provides some very suitable substitutes to the current lamps.

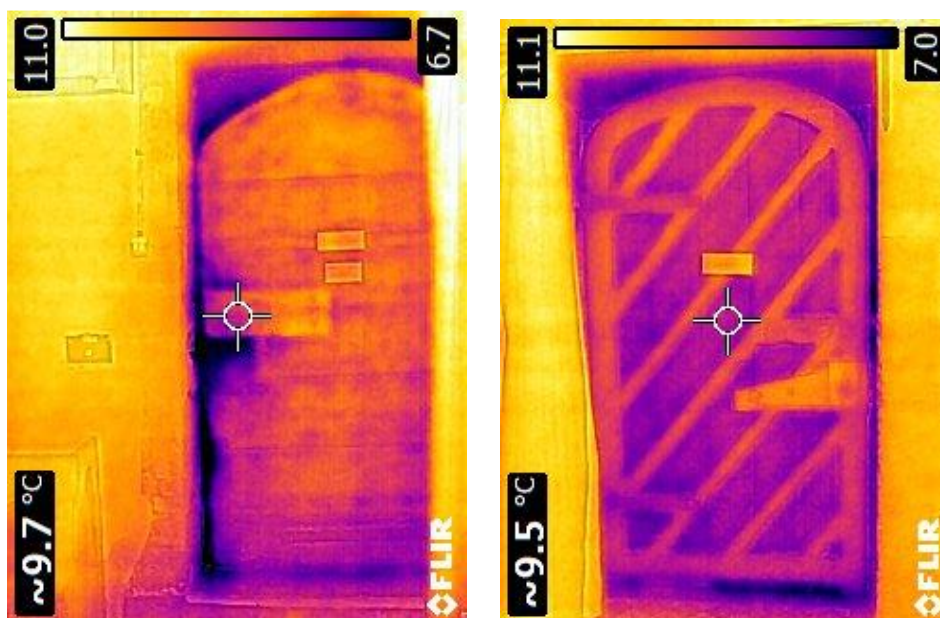
It is recommended that the fittings scheduled in Appendix 1 are all changed for LED.

If all the lights were changed the total capital cost (supplied and fitted) would be £1,144. The annual cost saving would be £73 resulting in a payback of around 15.7 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.



5.2 Quattro Seal

There are a number of external doors in the building. 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 in to the church around the side and base of these doors.



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

5.3 Heating Controls



The Economy 7 hours in this area are thought to be 2330 to 0630, whereas the night storage heaters are set to run from 2200 until 0700. (These hours should be checked and confirmed with your current electricity supplier (Total Gas and Power)). The input and output functions should then be adjusted to ensure that all input is completed within the 7-hour window of cheaper electricity.

At present, the Economy 7 tariff has little differential between weekday and night rate, so careful consideration should be made as to the best tariff for the church if the night storage heaters continue to be used. The night storage heaters should be switched off completely between April and October as typically outside temperatures are high enough to not require supplemental heating within the church.



5.4 Church Heating Options

The current heating approach in the church consists of 2 distinct systems: night storage heaters to provide background heating; and radiant heaters, sited at a height of over 5 metres, used when the church is occupied for additional heating to improve comfort levels for the congregation.

The night storage heaters are a mix of Dimplex and Creda brands, but both have the same basic control, with a dial for input and a dial for output.

Night storage heaters are now available with as automatic combination heaters, firstly providing thermostatic control, which would provide closer control over the output during the day time, allowing the church to heat to a set temperature, which could be as low as 10 degrees C as this is only to maintain a low level of heat within the church. Secondly, they also have a programmable schedule and convection heater which provides a boosted setting and can run during services and other occupied times. A more efficient replacement for the current storage heaters would be <https://www.electricpoint.com/dimplex-xle-storage-heater-1-5kw-xle150-low-energy-slimline-white.html> or <https://www.storageheatersdirect.com/elnur-ecombi-hhr40-fan-assisted-storage-heater-3400w/>

The moveable pews to the front of the nave mean that the preferred option for heating this church with under pew heaters is not feasible to the main area however it does appear that there are some fixed pews to the rear of the nave and in this case the use of under pew heaters such as <http://www.bnthermic.co.uk/products/convection-heaters/ph/> or <http://www.electricheatingsolutions.co.uk/Content/PewHeating> would be advised to provide the most useful and efficient form of heating.



6. 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	No – all visible roofs on listed building
Battery Storage	No – insufficient demand
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
Air Source Heat Pump	No – demand too low to warrant investment
Biomass	No – not enough continual heating load as well as air quality issues

Now that the Feed in Tariff scheme has come to an end the installation of solar PV panels in situations where there is not almost full usage of the electricity generated on site is not really viable.

Having reviewed the site it is not considered that there is good viability for any renewables and instead a good clear focus on reducing the energy demand of the building should continue with a targeted approach on reducing the heating energy.



7. 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.

8. 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 as 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
Porch	2	LED GLS	£1.22	£21.00	17.18
South and North Aisle	9	AR111 LED	£33.09	£400.86	12.11
Bell ringing room	6	R50 LED	£7.62	£71.34	9.36
Bell ringing room	4	Virgo 15W (190mm dia.)	£1.80	£185.24	103.18
Vestry	4	R50 LED	£5.08	£47.56	9.36
Lady Chapel	1	AR111 LED	£3.68	£44.54	12.11
Chancel	5	AR111 LED	£18.39	£222.70	12.11
Chancel	1	AR111 LED	£2.13	£44.54	20.89

