



Energy Audit and Survey Report  
St Mary's 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 Mary's Church, Hampstead Norreys, 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 Mary's Church is a 12<sup>th</sup> Century church, mostly rebuilt in the 13<sup>th</sup> Century with later additions made in 1879-80. The church has a main nave, west tower and vestry, with the main entrance through the North porch; the South porch has been filled in and is no longer in use. There is only electricity supplied to the site. This is a 3 phase 100amp supply which provides all the energy for heating via overhead infrared units, lighting and small power needs.

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.

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?
Change existing lighting for low energy lamps/fittings	1,202	£135	£1,227	9.06	List B	
Fit QuattroSeal to external doors	115	£13	£800	61.54	List B	

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

Based on a current blended contract price of 11.27p/kWh for electricity.

**If all measures were implemented this would save the church £148 per year.**



## 2. Introduction

This report is provided to the PCC of St Mary's 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.

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An energy survey of the St Mary's Church, Church Street, Hampstead Norreys, RG18 0TD was completed on 17<sup>th</sup> December 2018 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.

<b>St Mary's Church</b>	
Gross Internal Floor Area	400 m <sup>2</sup>
Listed Status	Grade I
Typical Congregation Size	50

The church typically used for 8 hours per week for the following activities

Services	2 hours per week
Meetings and Church Groups	3 hours per week
Community Use	3 hour per week

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 Mary's Church and have been reviewed against the current market rates for energy.

The current electricity rates are:

<b>Day Rate</b>	11.793 p/kWh	In line with current market rates
<b>Night Rate</b>	10.187 p/kWh	In line with current market rates
<b>Standing Charge</b>	42.42p/day	N/A

The current appears to now be out of contract, and procurement of a new electricity contract should be undertaken which should result in a rate which is lower than current rate. 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 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:

<b>VAT</b>	5%	The correct VAT rate is being applied.
<b>CCL</b>	100% charged / not charged / reduced % rate charged	The correct CCL rate is being applied.
<b>FiT</b>	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.



## 4. Energy Usage Details

St Mary's Church uses 5,752 kWh/year of electricity, costing in the region of £648 per year. However, most of the data provided by the supplier has been estimated and this may not be a true reflection of consumption. It is recommended to take regular monthly meter readings to determine accurate consumption.

This data has been taken from the annual energy invoices provided by the suppliers of the site (see Appendix 2). St Mary's Church has one main electricity meter, serial number D06C35424.

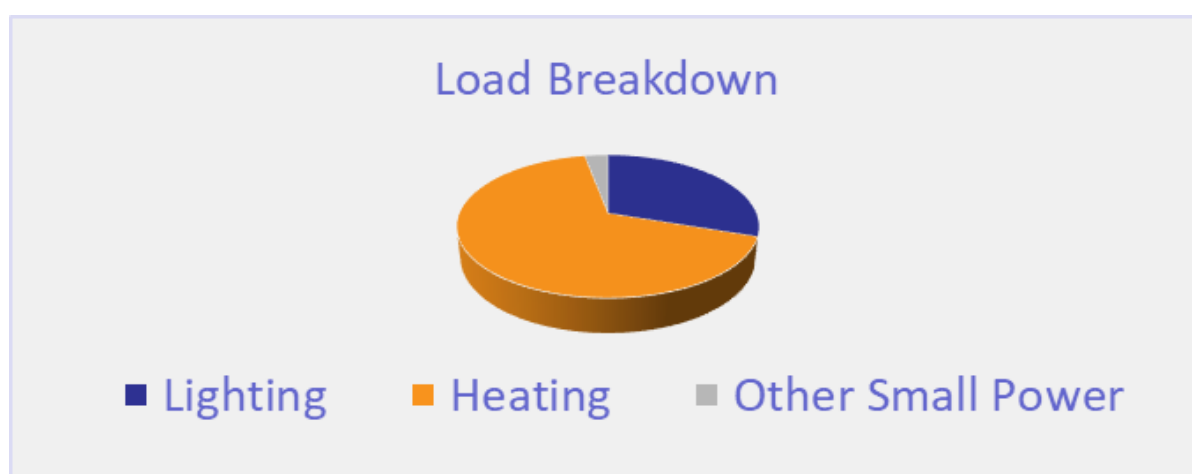
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	D06C35424	3 phase 100A	Yes but not AMR connected	Vestry

The meter is capable of providing a pulse output which in turn can be sent automatically to the energy company. This level of metering allows for an energy profile to be obtained so that the Church can see when it is using the most energy and take action accordingly. Given that there is currently only electricity provided to this site such an automated reading would give a full energy profile with one step.

### 4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	Mainly PAR38 spotlights with some LED replacements	30%
Heating	Overhead infra-red heaters	67%
Other Small Power	Appliances and the like	3%



As can be seen from this data, the heating makes up by far the largest proportion of the energy usage on site. The other significant load is lighting.



## 4.2 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Mary's Church uses 28% less energy than would be expected for a church of this size.

	Size (m <sup>2</sup> GIA)	St Mary's Church use kWh/m <sup>2</sup>	Typical Church use kWh/m <sup>2</sup>	Efficient Church Use kWh/m <sup>2</sup>	Variance from Typical
<b>St Mary's Church (elec)</b>	400	14.38	20	10	-28.1%
<b>St Mary's Church (heating fuel)</b>	400	Inc above	150	80	-100%
<b>TOTAL</b>	400	14.38	170	90	-91.5%

This benchmarking, together with the observations from site shows that St Mary's Church currently operates in an energy efficient manner however, it must be noted that while having low overall energy consumption, it does not provide a comfortable and therefore well used, building.



## 5. Energy Saving Recommendations

### 5.1 Lighting (fittings)



The lighting makes up a relatively large overall energy load within the building, and large areas are lit by relatively inefficient PAR38 spotlights.

The current lighting only allows for one 'mode' of lighting and the spot lights are downlighters. During any reordering works, it would be recommended that where spot lights are replaced, allowance is made to install an uplighter and a downlighter. Allowing separate control over these lights would then allow the beautiful wooden ceiling to be illuminated for candlelit services, Christingle services and the like, creating a more fitting ambience to the church.

New lighting should be around a 3000K colour temperature fittings should aim to be chosen and fitted as discretely as possible. One solution may be a track spot light system run on top of the timber moulding fixed to the wall plate. The JCC StarSpot 3000 range [https://www.jcc.co.uk/en\\_GB/products/jc14200wh](https://www.jcc.co.uk/en_GB/products/jc14200wh) is a good example and available to buy here <https://www.electrical2go.co.uk/jcc-starspot-3000-mains-ip20-spotlight-integral-led-34w-jc14200wh.html>, but cheaper options are also available.

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

If all the lights were changed on a like for like basis, the total capital cost (supplied and fitted) would be £1,227. The annual cost saving would be £135 resulting in a payback of around 9 years.

### 5.2 Door Draught Proofing

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](http://www.theenergysavers.co.uk/application/files/1714/7197/4194/National_Trust_Case_Study.pdf)





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## 6. New Heating Solutions for Reordering

The existing heating is provided from overhead radiant heaters located throughout the church (8 in the nave, 2 in the chancel 1 in the vestry and 1 in the bell ringers area). These are reported to be ineffective in heating the church.

There are plans to remove all the pews within the church and provide a large clear open space for a variety of functions including a drop-in café and a secular community group use as well as worship space. There are plans for water to be brought into the church to allow for tea making facilities and the like.

It is intended that the church will have regular daily use and therefore the heating requirements of the building will radically change from requiring intermittent heating to more regular use heating, but not constant heating, which is advised against. The movement towards more regular heating increases the importance of draught proofing and insulation; therefore, the aforementioned recommendation on draught sealing on the doors should be carried out. In addition, any opportunity to insulate the roofs with any roof replacement works in the future must be seized.

Having considered the proposed use of the building and its attributes, it is suggested that the most efficient method of heating the building will be to use far infrared panels which are zoned into three areas for church use (chancel, half church, full church including gallery), with separate control for the bell ringing area and vestry. The vestry and bell ringing areas could be controlled by a time delay push switch (i.e. push once for 30 minutes of heating).

A suitable heating solution would therefore be:

- Installing far infrared panels to the north and south walls at a low level as well as within the chancel and vestry. These heaters are to be used during occupied hours only and should be zoned/switched to allow closer control for smaller services or secular events.
- Installing an overhead door heater above the main entrance door to be used for a limited period of time prior to services or events to reduce cold air ingress from the main doors being repeatedly opened.
- Within the tower / bell ringing area, an overhead heater such as <https://www.warm4less.com/product/77/1800-watts-bar-heater> would provide heat to just this area without the need to heat the remaining areas of the church.

The proposed installation could therefore be:

- Remove all overhead radiant heaters to the nave, chancel and vestry and replace with far infrared panel heaters such as <https://www.warm4less.com/product/62/900-watt-platinum-white>. These could be fitted down each wall at a low level, below the line of any wall paintings or murals. One further panel could be installed behind the altar and two smaller panels within the gallery, again separately zoned/controlled.
- Install an overdoor heater full width on the white wall above the door surround of the North porch. The 890 unit from <http://www.bnthermic.co.uk/products/fan-assisted-heaters/800-series/> would be a suitable overdoor heater that is wide enough to fully cover the door.



All of the above could be carried out before the reordering and would help to improve the heating within the church and also the appearance as it removes the unattractive and red glowing infrared units. As the pews are being removed and replaced with more flexible heating arrangements, these works should be included as part of the overall faculty.

## 7. 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
Battery Storage	No
Wind	No
Micro-Hydro	No
Solar Thermal	No – no water on site
Ground Source Heat Pump	No – archaeological issues for ground works
Air Source Heat Pump	No – archaeological issues for ground works
Biomass	No

Due to the listed status of the church (Grade I) and the fact that there are no ‘hidden’ roofs or valleys, there is no possibility for on site generation technologies. The remaining site topography would not allow for most other technologies, with heat pump units having to be located within a visible location outside the church.

## 8. 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](http://www.trustforoxfordshire.org.uk) or contact [admin@trustforoxfordshire.org.uk](mailto:admin@trustforoxfordshire.org.uk) to find out if your project is eligible for a grant of up to about £5,000.



## 9. 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 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
Vestry	1	5ft Single LED	£3.29	£93.70	28.51
Chancel	3	NO CHANGE			
Chancel	3	PAR38 LED	£24.02	£133.62	5.56
Nave	3	NO CHANGE			
Nave	13	PAR38 LED	£104.11	£579.02	5.56
Under gallery	3	2D LED 7W	£4.05	£163.65	40.44

