



Energy Audit and Survey Report  
St Mary's Church, Beenham  
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, Beenham 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, Beenham is a Grade II\* listed building in a rural setting on the outskirts of Beenham village. The church was rebuilt in 1859 and comprises a nave and side aisles, accessed from a south porch. There are plans to construct an annexe to the North West corner of the church to facilitate church meetings, wider community use and smaller services. 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.

Short 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?
Change existing lighting for low energy lamps/fittings	1,274	£165	£812	4.92	List A/B	

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?
Fit Quattro seal draft proofing to historic doors	180	£23	£1,000	42.78	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 12.97p/kWh for electricity.

**If all measures were implemented this would save the church £188 per year.**



## 2. Introduction

This report is provided to the PCC of St Mary's Church, Beenham 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, Beenham, was completed on the 7<sup>th</sup> February 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, Beenham</b>	
Gross Internal Floor Area	250 m <sup>2</sup>
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	0 hours per week
Community Use	0 hours per week
Other	1 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, Beenham and have been reviewed against the current market rates for energy.

The current electricity rates are:

<b>Day Rate</b>	12.97 p/kWh	In line with current market rates
<b>Night Rate</b>	11.02 p/kWh	In line with current market rates
<b>Standing Charge</b>	23.31 p/day	N/A
<b>FIT Charges</b>	0.546 p/day	N/A

The above review has highlighted that the current rates being paid are in line with current market levels. However, upon contract renewal, 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:

<b>VAT</b>	5%	The correct VAT rate is being applied.
<b>CCL</b>	Not 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, Beenham uses 7,643 kWh/year of electricity, costing in the region of £986 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site (see Appendix 2). St Mary's Church, Beenham has one main electricity meter, serial number D10C43411.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity	D10C43411	3 phase 100A	Yes but no AMR connectivity	Vestry

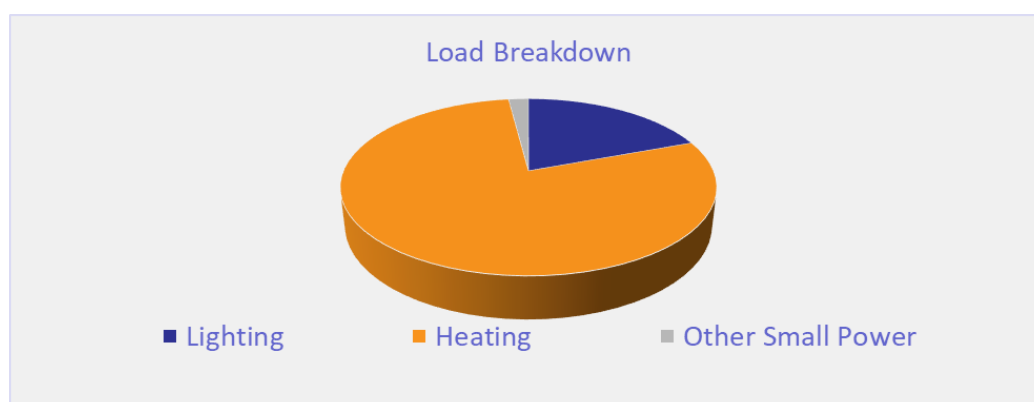
The most recent energy invoices provided for a 12-month period are all estimated readings, which may mean that the actual consumption on site deviates significantly from the consumption levels reported herein. It is strongly recommended that monthly meter readings are taken to not only ensure that the PCC is paying only for the energy it uses, but also to spot any atypical consumption patterns. The replacement of the existing electricity meter with a smart meter would also alleviate estimated billing from the supplier and could be considered.

It is recommended that AMR metering is collected on a single web-based portal such as Stark so that regular automated energy profiles can be easily produced and shared with the site team. LSI can arrange for this to be put in place.

### 4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	Largely inefficient SON flood lights and AR111 and PAR38 spot lights.	19%
Heating	Radiant heaters located above 4m on the wall plate.	79%
Other Small Power	Hot water urn, small plug in appliances and the like.	2%



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



## 4.2 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Mary's Church, Beenham uses 50% less electricity than would be expected for a church of this size.

	Size (m <sup>2</sup> GIA)	St Mary's Church, Beenham 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, Beenham (elec including heating)</b>	c. 250	30.59	61	44	-49.8%



## 5. Energy Saving Recommendations

### 5.1 Lighting (fittings)

The lighting makes up a significant amount of the energy load within the building, and large areas are lit by relatively inefficient flood and AR111 and PAR 38 spot light fittings, as well as SON flood lights in the chancel.

Given the open architecture of the interior of the church, the PCC may also wish to upgrade the lighting design in order to enhance the appearance of the interior of the church. It is recommended that the existing lights are replaced for LED units, but with the inclusion of an additional spot light to uplight the ceiling as well as the existing down lighters. As well as providing substantial energy savings from the current versions, LED lamps also have the advantage of having a longer life and can be dimmed to create a greater degree of different ambiances than is currently possible. The use of multi LED spot lights can be particularly effective in highlighting various features within the church such as the altar or font and units such as [https://www.jcc.co.uk/en\\_GB/products/jc14200blk](https://www.jcc.co.uk/en_GB/products/jc14200blk) can be very suitable.

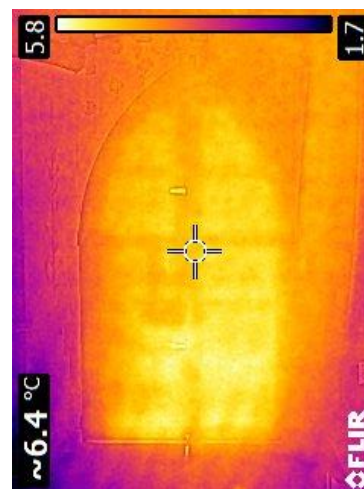
For the floodlight units, a like for like replacement could be made with an LED flood; care should be taken to ensure the right colour temperature of the light, and something between 3000K and 4000K is recommended. A fitting such as <https://www.ledkia.com/uk/buy-serie-slim-superslim/3629-black-50w-led-slim-glass-projector-spotlight.html> has a good slim profile and a colour in the ideal range.

All the lights are listed in Appendix 1. If all the lights were changed the total capital cost (supplied and fitted) would be £812. The annual cost saving would be £165 resulting in a payback of around 4.9 years.

### 5.2 Draughtproofing to external doors

The main entrance door has a useful porch area, but the outside door is usually held open in order to provide a welcoming arrival to the church. This means that the internal door is providing the barrier to the cold air entering the church. This door currently has worn and poor draught stripping and a gap between the doors as well as around the top, base and side is evident. It is recommended that the draught stripping and adjustment of this door is carried out to ensure a much better level of air tightness in this area.

There are other more historic doors within the church such as the door to the vestry. These too can have their draught proofing improved by using the Quattro seal system (<http://www.theenergysavers.co.uk/>) which is suitable for historic and listed buildings.





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## 6. Re-Ordering

### 6.1 New Extension Plans

The church has plans for a new extension to the north west corner to accommodate a meeting room and small kitchenette a variety of uses. This space is likely to be used for short periods at various times during the week and will not require constant heating. It should therefore be designed to be able to accommodate being unheated for periods when it is not being used and able to be heated up quickly and effectively when being used. The inclusion of good standards of insulation and air tightness within any new fabric will therefore be important. In this regard the church should specify that wall and roof insulation should be in excess of the current Part L building regulation standards, and that a tested air tightness of no more than 5 m<sup>3</sup>/hr/m<sup>2</sup> at 50Pa should be achieved. The existing 3 phase electrical installation should be sufficient to provide the main supply to a sub distribution board located in the new area.

For the heating it is recommended that the use of electrically far infrared panel heaters (<https://www.warm4less.com/product/62/900-watt-platinum-white>) with a simple time lag switch (<https://www.danlers.co.uk/time-lag-switches/77-products/time-lag-switches/multi-selectable-time-lag-switch/159-tlsw-ms>) would be most appropriate. These panels are very thin and can discretely be mounted on the walls or even built into the ceiling of the extension, and they are very effective and efficient at warming the space quickly. They should be switched on about 20 minutes before the space is occupied and then turned off immediately when the space is empty.

Given that over 40% of the heating time is currently used for the morning prayer service, once the extension is completed it could be worth considering if this area will provide a more comfortable and efficient location to hold this service so that the existing radiant heaters (note new suggested heating system detailed below) is not required to come on to heat all of the church for any small services or meetings and also that the extension will be able to provide a much warmer and comfortable environment for those attending.

Any new provision of hot water to the kitchen and WC should be provided by an electric point of use heater which has little or no stored water within it; simple over sink units can be very effective in this situation.

### 6.2 Church Heating

Beyond the faculty for replacement lighting that has been rejected by the Diocese at present, there are no current re-ordering plans. However, it was noted that the church is heated by radiant heaters, located over 4 metres above the ground. At this height, these heaters will be largely ineffective at providing heat where it is needed and are using a lot of electricity to attempt to heat the space.



Given that the pews are remaining in situ, and the typical congregation sizes are less than 50, it is recommended that electric under pew heating is considered as a replacement for the existing radiant heaters.

The church could consider leaving the overhead radiant heaters in the nave as a backup or for larger services, but installing under pew heaters to the front 6 rows of pews. 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.electriceatingsolutions.co.uk/Content/PewHeating>. Cable runs to the pew heaters could be introduced as part of the new extension works as cabling will be required for a new sub distribution board to the NW corner (all cabling should be in armoured cable or FP200 Gold whe above ground). From this main cable, spurs running across to the pews could be viable, with some possible ground work to lay cabling under the existing floor.

The priest's vestry is used for short periods of time only. Given the nature of its use a simple Far infrared electric panel heater (<https://www.warm4less.com/store/7/premium-white-panels>) with a time delay switch (<https://www.danlers.co.uk/time-lag-switches/77-products/time-lag-switches/multi-selectable-time-lag-switch/159-tlsw-ms>) will be a suitable and simple solution where the occupant can switch on the heat which will provide instant heat and it will then automatically switch off after the chosen amount of time so that it is not able to be left on accidentally.



## 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 – Visible roofs
Battery Storage	No – No viable PV
Wind	No – No suitable land
Micro-Hydro	No – No water course
Solar Thermal	No – no significant hot water demand
Ground Source Heat Pump	No – archaeology
Air Source Heat Pump	Yes – but no need with current heating system
Biomass	No – no existing wet heating system and issues with storage and deliveries

Given that all the roofs are highly visible and the other attributes of this church there are no renewable energy generation measures that are considered feasible to consider at the current time.



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## 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 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
Altar	3	R50 LED	£8.24	£35.67	4.33
Altar	4	50W LED Flood	£2.52	£365.20	144.64
Bell Ringing Area	1	50W LED Flood	£2.51	£91.30	36.39
Nave	2	R50 LED	£3.38	£23.78	7.04
Nave	1	R50 LED	£2.75	£11.89	4.33
Side aisles	9	R50 LED	£15.20	£107.01	7.04
Vestry	1	LED GLS	£1.23	£10.50	8.56

