



# Energy Audit and Survey Report St Peters' Church, Charney Basset



*"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	29 <sup>th</sup> July 2019	1.0

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## 1. Executive Summary

An energy survey of St Peters' Church, Charney Basset 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 Peters' Church, Charney Basset is Grade 1 listed rural parish church which dates back to the 12<sup>th</sup> Century with additions in the 14<sup>th</sup> and 15<sup>th</sup> centuries. 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	150	£26	£154	5.98	List A	

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?
Upgrade under pew tube heaters to norel or BN Thermic	335	£57	£3,000	52.27	List B	
Far IR panel heaters to chancel	N/A	N/A	£500	N/A	List B	

Long 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 draft proofing to historic doors	45	£8	£800	104.76	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 17.14p/kWh for electricity.

**If all measures were implemented this would save the church £91 per year.**



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## 2. Introduction

This report is provided to the PCC of St Peters' Church, Charney Basset 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 Peters' Church, Charney Basset is a Grade 1 listed rural parish church which dates back to the 12th Century with additions in the 14th and 15th centuries.

An energy survey of the St Peters' Church, Charney Basset, Main St, OX12 0EJ was completed on the 2<sup>nd</sup> July 2019 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.

<b>St Peters' Church, Charney Basset</b>	
Gross Internal Floor Area	100 m <sup>2</sup>
Listed Status	Grade I
Typical Congregation Size	15

The church typically used for 4 hours per week for the following activities

Services	2 hours per week (Two 3 hours services per month)
Meetings and Church Groups	1 hour per week (Mid-week service)
Other	1 hour per week (occasional concerts)

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 Peters' Church, Charney Basset and have been reviewed against the current market rates for energy.

The current electricity rates are:

<b>Single / Blended Rate</b>	17.14p/kWh	Above current market rates
<b>Standing Charge</b>	42.42p/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:

<b>VAT</b>	5%	The correct VAT rate is being applied.
<b>CCL</b>	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 Peters' Church, Charney Basset uses 3,118 kWh/year of electricity, costing in the region of £540 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Peters' Church, Charney Basset has two main electricity meters, serial number S68C18687 and S68C23906. There appears to be a 3phase 100A supply coming into the church but this has only two of the phases taken off into 2 separate single-phase meters.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	S68C18687	1 phase 100A	No	Rear of Nave
Electricity – Church	S68C23906	1 phase 100A	No	Rear of Nave

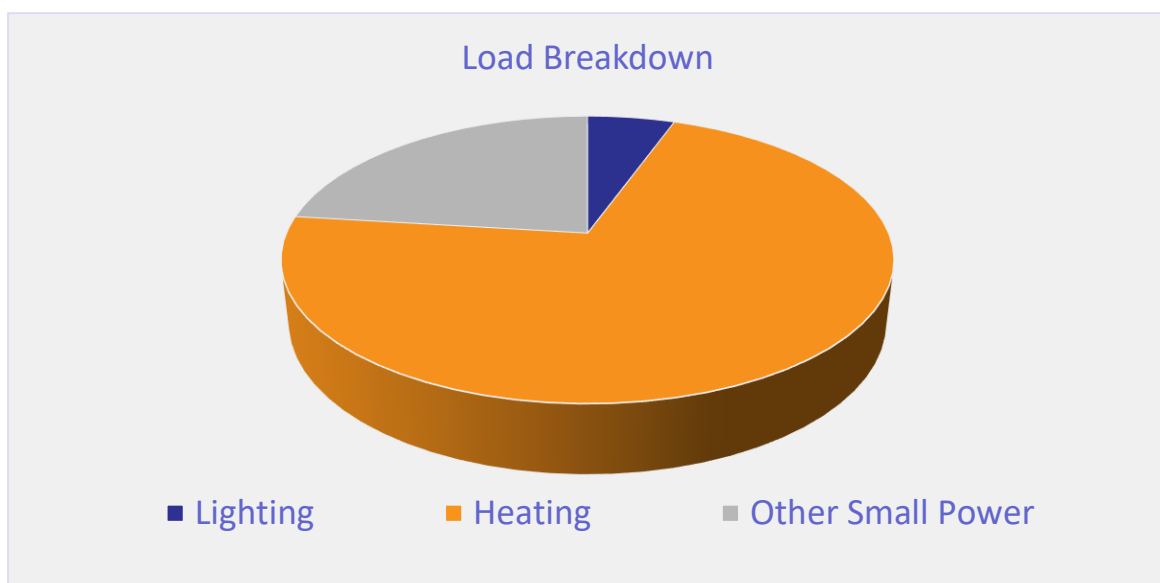
It is recommended that the church consider asking their suppliers to install smart meters so that the usage can be monitored more closely and the patterns of usage reviewed against the times the building is used.



## 4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	Inefficient reflector lamps and old GLS lamps throughout.	5%
Heating	Mix of under pew tube heaters, overhead pendants units in nave and radiant heater in chancel	71%
Other Small Power	Appliances, supplemental plug in heaters, organ and the like.	23%



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 Peters' Church, Charney Basset uses 82% less energy than would be expected for a church of this size. This is a reflection of the low usage of the church and that it has an efficient approach to its heating in using direct electrical heating only when the church is in use.

	Size (m <sup>2</sup> GIA)	St Peters' Church, Charney Basset 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 Peters' Church, Charney Basset (elec)</b>	100	31.18	20	10	56%
<b>St Peters' Church, Charney Basset (heating fuel)</b>	100	0.00	150	80	-100.00%
<b>TOTAL</b>	100	31.18	170	90	-82%





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## 5. Energy Saving Recommendations

### 5.1 Lighting (fittings)

The lighting throughout the church is all old and inefficient units but this can be simply upgraded to efficient LED lighting by changing the lamps (bulbs) within the existing fittings.

It is recommended that all of the bulbs, scheduled in Appendix 1, are changed for LED.

For the PAR 38 lamps it is suggested that these are changed for Megaman PAR38 LED units in Warm White – these are widely available from sources such as

<https://www.ledbulbs.co.uk/products/megaman-15-5w-led-es-e27-warm-white-35deg-141384>

For the R63 units a similar Megaman LED warm white specification could be used such as

<https://www.ledbulbs.co.uk/products/megaman-7-50w-led-es-e27-warm-white-90deg-616497>

For the light in the chancel a high output (20W + ) LED GLS lamp is need . If this has a bayonet cap fitting then something along the lines of <https://www.bltdirect.com/integral-non-dimmable-led-gls-18w-bc-very-warm-white-120w-alternative> would be suitable. If tis i a screw cap fitting then a lamp such as <https://www.bltdirect.com/osram-parathom-pro-20w-frosted-es-gls-150w-alternative-very-warm-white> would be suitable.

In all cases care should be taken to select bulbs which have a colour temperature of around 3000K (often called 'Warm White').

If all the lights were changed the total capital cost (supplied and fitted) would be £154. The annual cost saving would be £26 resulting in a payback of around 5.98 years. 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 Under Pew Heaters

Given the church's usage profile we would suggest that the direct electrical heating strategy for the church provides an efficient use of energy. The current under-pew tube heaters are of such a low output and of an age where they are not likely to be effective at providing comfort. The high level infra-red heaters on the pendant light fittings are a little too high to be effective in warming the congregation and emit an unpleasant red glow. These could be retained for additional top-up heating on the occasions it is required but mainly not used.

As with most medieval churches, this church would have survived most of its life without any form of heating; the modern addition of heating is not needed to preserve the fabric but only to provide thermal comfort to occupants. The previous trend of 'conservation heating' for fabric issues is now largely considered to be unnecessary and is being avoided by the likes of National Trust and English Heritage.

We would recommend that the under-pew tube heaters be replaced for under-pew panel heaters which have a much greater heat output than the tube heaters. For replacement, 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>. There are existing cables running to the heaters so it is possible that these could be reused.

The under-pew (see photo below) and panel heaters have been recently installed at St Andrews Church, Chedworth, Gloucestershire, GL54 4AJ. The church is open in daylight hours so can be viewed at any time.



### 5.3 Use of Electric Panels for Heating Chancel

The heating in the chancel is currently a combination of poor under pew tube heaters to the choir stalls and an ineffective overhead radiant heater mounted high on the east side of the chancel arch. It is recommended that the PCC consider installing electrical panel heaters in this area on a time delay switch and removing the overhead unit as well as installing panel heaters under the choir stalls as above. There is a suitable wall area at the end of the communion rail where a heater could be discretely located.

Suitable electric panel heaters would be far infrared panels such as <https://www.warm4less.com/product/63/1200-watt-platinum-white-> . These can be purchased widely and fitted by any competent electrician. It is recommended that they are fitted with a time delay switch such as <https://www.danlers.co.uk/time-lag-switches/77-products/time-lag-switches/multi-selectable-time-lag-switch/159-tlsw-ms> so they cannot be left on accidentally after use.



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## 5.4 Draught Proofing External Doors

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 into 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)



## 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	Yes - but only as small array on part of nave roof
Battery Storage	Yes - but very small unit only
Wind	No – No suitable site
Micro-Hydro	No – Water course
Solar Thermal	No - No significant hot water need
Ground Source Heat Pump	No – Does not match heating needs of church
Air Source Heat Pump	No– Does not match heating needs and fabric of church
Biomass	No – issues with deliveries, storage and existing heating system



There is potential for a small PV array on the roof of the nave. 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 and the consumption during the daytime when the sun is shining is likely to be very low indeed, therefore while technically viable only a very small number of panels (maximum of around 4) would be worth considering if at all.

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. This is a new but fast-growing technology with prices expected to fall substantial over the next 2 to 3 years therefore investment into this may be worth delaying at this stage.



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## 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](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.

## 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
<b>Nave</b>	3	PAR 38 LED	£13.23	£64.47	4.87
<b>North aisle</b>	1	PAR 38 LED	£4.41	£21.49	4.87
<b>Lectern</b>	1	R63 LED	£1.10	£21.49	19.51
<b>Chancel</b>	1	LED GLS	£5.88	£10.50	1.78
<b>Altar</b>	1	R63 LED	£1.10	£21.49	19.51

