

## Energy Efficiency and Zero Carbon Advice

---



St Mary's, East Ilsley  
PCC of St Mary's



Author	Reviewer	Date	Version
Tamsin Hockett	Matt Fulford	11 <sup>th</sup> December 2020	1.0



## Contents

1. Executive Summary.....	3
2. The Route to Net Zero Carbon.....	4
3. Introduction.....	5
4. Energy Procurement Review.....	6
5. Energy Usage Details.....	7
5.1 Energy Profiling.....	7
5.2 Energy Benchmarking.....	8
6. Efficient / Low Carbon Heating Strategy.....	9
6.1 Install Electric Panel Heaters.....	9
7. Energy Saving Recommendations.....	10
7.1 New LED Lighting.....	10
7.2 External Lighting Controls.....	11
7.3 Draught Proof External Doors.....	11
8. Renewable Energy Potential.....	12
9. Funding Sources.....	12
10. Faculty Requirements.....	13
Appendix 1 – Schedule of Lighting to be Replaced or Upgraded.....	14



## 1. Executive Summary

An energy survey of St Mary's 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 dates back to the 13<sup>th</sup> Century, with additions of the North porch and North aisle in the 19<sup>th</sup> Century. The heating is provided by overhead infrared heaters with three floor mounted electric heaters. The lighting is mainly older style GLS lamps with external flood lights. 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.

Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Payback (years)	Permission needed	CO2 saving (tonnes of CO2e/year)
Adjust existing timer on external lighting	73	£14	Nil	Immediate	List A (none)	0.02
Install a Solar PV array to tower roof (assumed 100% of energy generated used in building)	997	£187	£1,942	10.36	Faculty	0.25
Add or Replace draught strips to external doors	70	£13	£300	22.83	List A (None)	0.02
Change existing lighting for low energy lamps/fittings	186	£35	£1,972	56.25	Faculty	0.05
Replace heating system for electrical based heating solution	956	£180	£14,920	83.02	Faculty	0.24

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



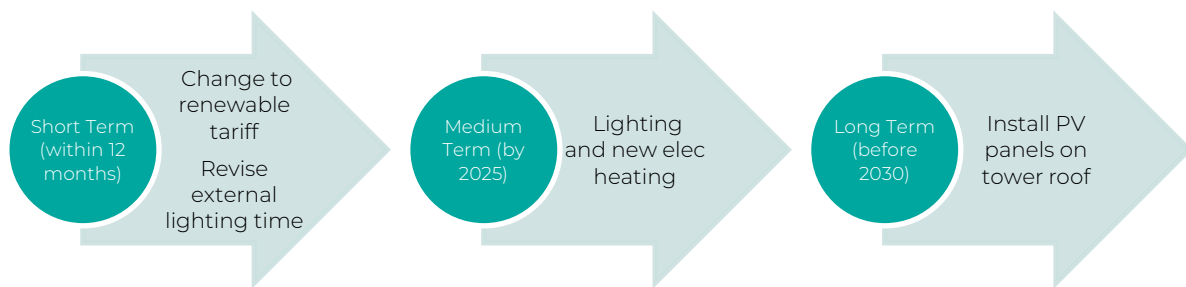
Based on current contracted price of 18.8p/kWh for electricity.

If all measures were implemented this would save the church £429 per year.

## 2. The Route to Net Zero Carbon

The Diocese of Oxford's Diocesan Synod has set a target of reaching Net Zero Carbon by 2035, or as soon thereafter as is possible. General Synod, meanwhile, has set a target for the Church of England to reach a limited-scope Net Zero Carbon target by 2030. Our diocese will need to respond to the national target. which, as it is presently framed, means that every church, cathedral, church school and vicarage in the C of E will need to reach net zero - or compensate for residual emissions - within the next ten years..

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 Mary's to give them 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 Mary's, Church Hill, East Ilsley, Newbury, Berkshire, RG20 7LU was completed on the 23<sup>rd</sup> October 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 Mary's	
Church Code	627420
Gross Internal Floor Area	231 m <sup>2</sup>
Listed Status	Grade I

The church typically used for 2 hours per week for the following activities

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Services	2 hours per week	14

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



#### 4. Energy Procurement Review

Energy bills for electricity have been supplied by St Mary's and have been reviewed against the current market rates for energy.

The current electricity rates are:

Weekday daytime Rate	20.38p/kWh	Above current market rates
Night Rate	15.69p/kWh	Above current market rates
Other times Rate	18.80p/kWh	Above current market rates

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.

The electricity is supplied by Southern Electric, and is not purchased on a renewable tariff .

Going onto a renewable tariff is an important part of the process of taking churches towards net zero. The church is therefore encouraged to consider the Parish Buying Scheme, which uses the power of group purchasing to offer economies of scale in the procurement of energy. Its 'Green Energy Basket' tariff delivers 100% renewable electricity and 20% green gas. We would recommend that the church obtain a quotation for its gas and electricity supplies from the scheme: <http://www.parishbuying.org.uk/energy-basket>. Alternatively, Bulb, Ecotricity and Good Energy are suppliers which offer 100% renewable electricity.

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	100% charged / not charged / reduced % rate charged	The correct CCL rate is being applied.

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



## 5. Energy Usage Details

St Mary's uses 4,740kWh/year of electricity, costing in the region of £891.12 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Mary's has one main electricity meter, serial number P99C78217.

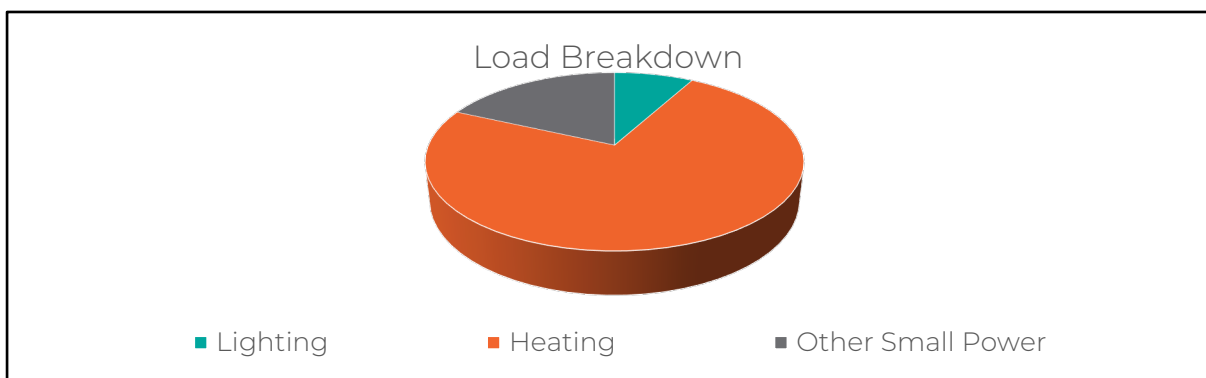
Utility	Meter Serial	Type	Pulsed output	Location
Electricity Church	P99C78217	PRI Sprint	Pulse output, no AMR connected	Old vestry

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 old style GLS reflector lamps internally, external flood lights	8%
Heating	Overhead IR bar heaters and three floor mounted electric heaters	74%
Other Small Power	Organ, kitchen and cleaning appliances and the like	18%



As can be seen from this data, the heating 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 Mary's uses 88% less energy than would be expected for a church of this size.

	Size (m <sup>2</sup> GIA)	St Mary's use kWh	St Mary's use kWh/m <sup>2</sup>	Typical Church use kWh/m <sup>2</sup>	Variance from Typical
TOTAL	231	4,740	20.51	90	-87.9%





## 6. Efficient / Low Carbon Heating Strategy

The energy used for heating a church typically makes up around 80% to 90% of the overall energy consumption. Heating also often uses gas or oil as its primary fuel, these are fossil fuels with high carbon emissions and little opportunity to decarbonise in the future. Electricity currently has carbon emissions around the same level as mains gas but the carbon emissions associated with electricity are reducing rapidly as the UK builds more renewable energy and decommissions its remaining oil and coal fired power stations. Mains gas does have some potential to reduce its carbon content through the use of bio gas and hydrogen but these are less developed solutions and will be unable to deliver 'zero carbon mains gas'. It is therefore a critical element to review and set out a plan to make more efficient and less carbon intensive and one way to achieve this is to consider a transition to electrical heating where this also represents a more efficient and comfortable solution for churches.

This church already uses electricity only for all of its heating however this is provided by aged electric heating units and their performance in providing comfort is poor. The church heating is currently provided by 14 overhead infrared bar heaters and 3 floor mounted electric heaters and it is considering removing the existing pews. It is therefore recommended that the church consider a mix of upgrading the existing over head heaters, adding in panel heaters to the walls of the side aisles and introducing an overdoor air heater to prevent cold air coming in from the door and providing a method of boosting the heat prior to a service.



### 6.1 Install Electric Panel Heaters

It is recommended that the PCC consider installing electrical panel heaters in the church on a time delay switch and removing some of the existing heaters.



We would recommend positioning the new panel heaters in the following locations:

Area	Type/ Size	Length (mm)	Watts	Number (or m) Required
<b>Chancel</b>	<b>Overhead Far IR Bar Heater 1.5kW</b>	<b>1580</b>	<b>1500</b>	<b>4</b>
<b>Nave</b>	<b>Overhead Far IR Bar Heater 1.5kW</b>	<b>1580</b>	<b>1500</b>	<b>8</b>
<b>South aisle</b>	<b>Electric Far IR Wall Panel 700W</b>	<b>1200</b>	<b>700</b>	<b>6</b>
<b>Tower</b>	<b>Near IR Overhead Heater 1.5kW</b>	<b>480</b>	<b>1500</b>	<b>1</b>
<b>North aisle</b>	<b>Electric Far IR Wall Panel 700W</b>	<b>1200</b>	<b>700</b>	<b>5</b>
<b>Vestry</b>	<b>Electric Far IR Wall Panel 700W</b>	<b>1200</b>	<b>700</b>	<b>1</b>
<b>North door</b>	<b>Overdoor air heater 6kW</b>	<b>1105</b>	<b>6000</b>	<b>1</b>

Suitable electric panel heaters would be far infrared panels such. These can be purchased widely and fitted by any competent electrician. It is recommended that they are fitted with a time delay switch so they cannot be left on accidentally after use.

These heaters have a strong radiative effect (where heat is reflected to people from the surface) as well as a light convective effect (where air is warmed and moves around to heat the general space). As such these heaters tend to provide a relative instant sense of heat and comfort within the space and only need to be on for short periods of time.

## 7. Energy Saving Recommendations

In addition to having a revised heating strategy there are also a number of other measures that can be taken to reduce the amount of energy used within the church.

### 7.1 New LED Lighting

The lighting makes up a relatively small overall energy proportion of the electricity used within the church, and large areas are lit by relatively inefficient GLS fittings.

It is recommended that the fittings scheduled in Appendix 1 are all changed for LED. There are a vast number of specifications of LED lights on the market but it is recommended that any LED light should come with branded chips and drivers and offer a 5-year warranty.





## 7.2 External Lighting Controls

The external flood lights are currently on 334 hours per year. For efficient operation and to reduce light pollution and nuisance to neighbours it is generally recommended that external lighting is turned off between 10pm and 6am unless required for specific purposes.

It is therefore recommended that the existing timer is adjusted to switch off the external lights after 10pm and also over the weekend if not required. A timeclock with a time and day capacity is recommended over those that only have time of day capacity.

## 7.3 Draught Proof External Doors

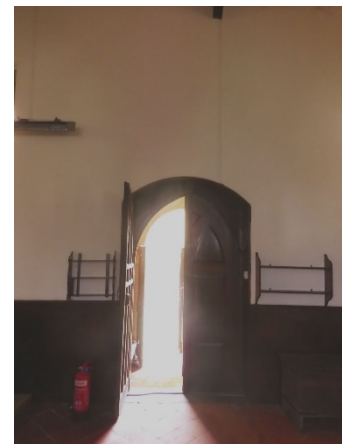
There are a number of external doors in the church. These have the original historic timber doors on them, but these do not close tightly against the stone surround and hence a large amount of cold air is coming into the church around the side and base of these doors.

It is recommended that the draughtproofing around the door is improved and draught strips are added. This could be achieved in a number of ways.

For timber doors that close onto a timber frame a product called QuattroSeal (see link below) is often used in heritage environments to provide appropriate draught proofing.

For timber doors that close onto a stone surround more traditional solutions such as brush draught strips rebatted into the edge of the door by a skilled joiner. Other traditional methods such as using hessian or felt pads tacked to the door could be used and keeping the door maintained in a good condition is important.

Simple measures such as having a 'sausage dog' style draught excluder laid along the base of a door, using plasticine of the right colour to fill gaps where daylight can be seen and putting painted fridge magnetic over large keyholes can all be simple DIY measures which are effective.





## 8. Renewable Energy Potential

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

Renewable Energy Type	Viabile
Solar PV	Yes- on tower roof only
Wind	No – no suitable land away from buildings
Battery Storage	Yes - with PV
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Biomass	No – not enough heating load as well as air quality issues
Air Source Heat Pump	No – insufficient electricity supply
Ground Source Heat Pump	No – archaeology in ground and radiator system

There is potential for a small PV array on the roof of the tower. 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.

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.

## 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>.



## 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 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
North aisle	2	50W LED Flood	£5	£240	50
North aisle	1	NO CHANGE	£0	£0	0
Nave	2	50W LED Flood	£5	£240	50
Nave	2	50W LED Flood	£5	£240	50
Tower	1	LED GLS	£0	£12	29
Chancel	2	50W LED Flood	£5	£240	50
Old vestry	1	LED GLS	£1	£12	10
External -SON70	6	50W LED Flood	£14	£720	51
External- LED	2	NO CHANGE	£0	£0	0



1 The Coaches, Fields Road, Chedworth, GL54 4NQ

01285 721134

07971 787363

