



Energy Audit and Survey Report

St Mary the Virgin Church, Shipton under Wychwood



"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

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1. Executive Summary

An energy survey of St Mary the Virgin Church, Shipton under Wychwood 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 the Virgin Church, Shipton under Wychwood is 14th century parish church which was subject to a major Victorian restoration. There are currently roof repair works being undertaken and reordering plans developed. There is both gas and 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	Permission needed	CO2 saving (tonnes of CO2e/year)
Contact electricity supplier to arrange for the meter to be changed to a smart meter	None	None	Nil	N/A	None	N/A
Switch electricity (and gas) suppliers to ones which provide 100% renewable (or green gas) supplies	None	None	Nil	N/A	None	N/A
Change existing lighting for low energy lamps/fittings	793	£96	£1,538	15.98	List B / Faculty	0.24
Fit Quattro seal draft proofing to historic doors	152	£18	£800	43.25	List B	0.05
Bring in new 3 phase electricity supply and install under pew heating to choir and retained pews, wall mounted panel heaters to altar etc. and ceiling mounted panels to North Aisle	7,620 kWh saving in gas but increased electricity	N/A	£20,000	N/A	Faculty	1.40 (if electricity sourced from renewables)
Use under plinth heater to new servery/café area, add underfloor insulation as part of	N/A	None	With reordering works	N/A	Faculty	N/A



floor works and electric underfloor heating mat to non-pewed areas.						
Consider a small array of PV panels on south facing nave roof	3,500	£425	£5,000	11.77	Faculty	1.08

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

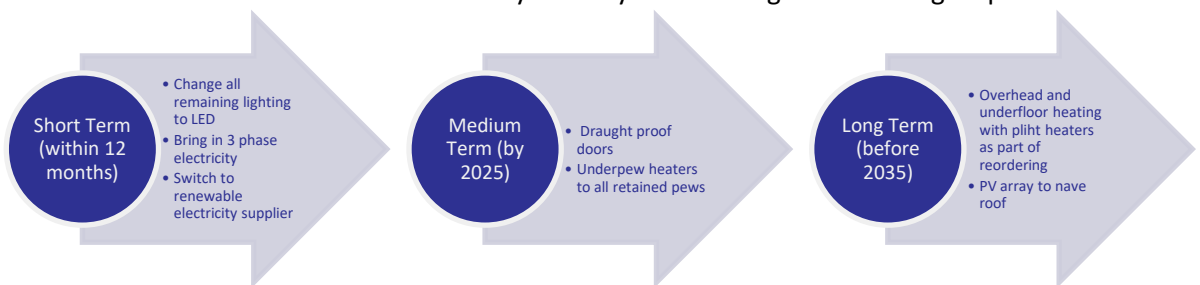
Based on current contracted prices of 12.14p/kWh and 2.19p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £540 per year.

2. The Route to Net Zero Carbon

The General Synod of the Church of England has indicated that the Church of England should be Net Zero Carbon by 2030, and is counting in its approach to net zero each church, cathedral, voluntary aided or diocesan MAT church school, and vicarage. The Diocese of Oxford has also declared a climate emergency and has an ambition to be carbon neutral by 2035.

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 the Virgin Church, Shipton under Wychwood 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.

An energy survey of the St Mary the Virgin Church, Shipton under Wychwood, Church St, Shipton under Wychwood, Oxon, OX7 6BP was completed on the 23rd March 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 the Virgin Church, Shipton under Wychwood	627092
Gross Internal Floor Area	575 m ²
Listed Status	Grade I
Typical Congregation Size	60

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

Services	2 hours per week
Meetings and Church Groups	2 hours per week

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



4. Energy Procurement Review

Energy bills for gas and electricity have been supplied by St Mary the Virgin Church, Shipton under Wychwood and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	13.89p/kWh	In line with current market rates
Night Rate	12.14p/kWh	In line with current market rates
Standing Charge	22.9873p/day	N/A

The current gas rates are:

Single / Blended Rate	2.19p/kWh	Below current market rates
Standing Charge	0.47p/day	N/A

The above review has highlighted that the current rates being paid are in line or below current market levels and the organisation can be confident it is receiving good rates and should continue with their current procurement practices. 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:

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.



5. Energy Usage Details

St Mary the Virgin Church, Shipton under Wychwood uses 6,377 kWh/year of electricity, costing in the region of £774 per year, and 7,620kWh/year of gas, costing £167.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Mary the Virgin Church, Shipton under Wychwood has one main electricity meter, serial number LO7C49198. There is one gas meter serving the site, serial number E025K0194416D6.

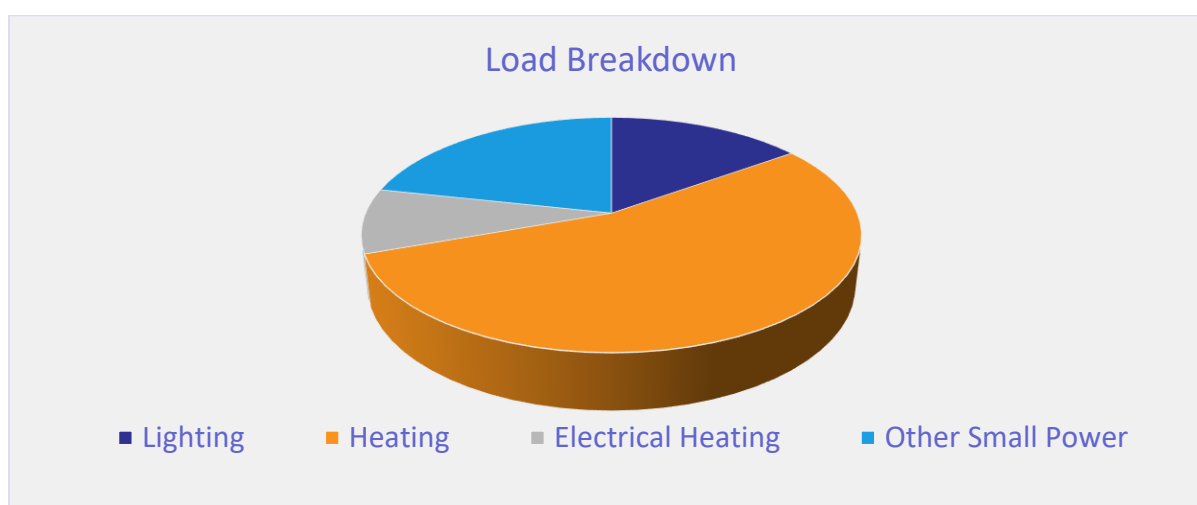
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	LO7C49198	1 phase 100A	None	Electrical meter cupboard
Gas – Church	E025K0194416D6	BK-G16E	Full AMR Meter	External gas meter cupboard

It is recommended that the church consider asking their electricity supplier to install a smart meter 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	Internal flood and spot lighting and two external flood lights. A few lights are already LED.	15%
Gas Heating	Gas overhead direct fired heaters. Note combustion products are not flued outside and remain within the church building resulting in fabric issues.	54%
Electrical Heating	Electrical panel heating to the choir vestry and the like	9%
Other Small Power	Organ, sound equipment and other uses.	22%



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 the Virgin Church, Shipton under Wychwood uses 45% less electricity and 91% less heating energy than would be expected for a church of this size.

	Size (m ² GIA)	St Mary the Virgin Church, Shipton under Wychwood use kWh/m ²	Typical Church use kWh/m ²	Efficient Church Use kWh/m ²	Variance from Typical
St Mary the Virgin Church, Shipton under Wychwood (elec)	575	11.09	20	10	-45%
St Mary the Virgin Church, Shipton under Wychwood (heating fuel)	575	13.25	150	80	-91%
TOTAL	575	24.34	170	90	-86%

Generally, this church can be considered as a very low energy user as it has a very small amount of usage during the week and a heating system which is only turned on when it is required (no background heating). The main issue is that the use of direct fired gas heaters in the church is a very unsuitable solution for the fabric and not ideal in term of thermal comfort.



6. Energy Saving Recommendations

6.1 Lighting (fittings)



The lighting makes up a relatively small overall energy load within the building, and all areas are lit by inefficient fittings.

It is recommended that the two external flood lights are changed for LED units and that the lighting inside the church is replaced for new LED lights as part of the reordering. There are a wide variety of LED flood lights and spotlights available. When specifying LED lights,

the colour output of them should be in the region of 3500K.

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

If all the lights were changed like for like the total capital cost (supplied and fitted) would be £1,538. The annual cost saving would be £96 resulting in a payback of around 16 years. However, the church may well wish to upgrade the light fittings and provide an enhanced lighting solution which will result in higher capital costs but an improved outcome.

6.2 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 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



6.3 Future Heating Solutions

The existing gas heaters within the church are entirely unsuitable. They release their combustion products, including very high levels of moisture, into the interior of the building and this will be a significant contributory reason for the decay of the roof timbers. Gas is a fuel which is almost impossible to fully decarbonise and therefore does not allow for a zero carbon future. The gas meter is also very clumsily located in the corner of the south aisle and is restricting the ideal layout of future reordering in that area.



Given the usage of the church, even with some increase in use after reordering, it is considered that an electrical heating solution would be the most suitable in terms of efficiency and comfort. At present there is only a single phase 100A supply into the church but there is an electricity pole located on the south east corner which has three phase power available on it. Investigation should therefore be made as to whether a 3 phase 100A supply can be relatively simply provided from this location into the church to support future electrical heating solutions and allow for the complete removal of the gas supply.

The electrical heating solution should then be developed for each area.

Altar

For the altar areas it is recommended that two far IR panel heaters could be used. 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 can not be left on accidentally after use.



Choir

The existing choir stalls are due to remain and therefore the use of under pew electric heaters would be most suitable for this space. 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 run along under or behind the choir stalls (all cabling should be in armoured cable or FP200 Gold when above ground) quite easily. Such pew heaters have been installed widely across many churches and a recent good installation can be seen at St Andrews Church, Chedworth, GL54 4AD.

Front of Nave

The current works mean that the nave pews have largely been removed, but the future reordering plans currently show pews to be retained in the nave. It is therefore recommended that all pews retained in the nave (as well as the south and north aisles) should have under pew heaters fitted. These pews may only be fitted in a way that they could be moved for specific events although their movement will require a well-equipped team to move the pews safely. If this is the case then the pew heaters could be plugged into carefully positioned floor box sockets so that whenever the pews are moved, the floor remains flush.

North Aisle

The proposals for the north aisle suggest that much of this will not have pews within it but the ceiling height in this area means that overhead panel heaters could be used. These have been successfully used in a similar situation within the Diocese at St Marys, Chalgrove (pictured)



South Aisle and Rear of Nave

The south aisle and the rear of the nave are not currently due to have pews put back into them and are to remain open spaces. Within the south aisle it may be possible to use overhead panels as per the north aisle but it should be noted that the ceiling arrangement is different and less ideal for this. To the rear of the south aisle and the rear of the nave a servery is proposed and this allows for under plinth fan heaters such as <https://www.dimplex.co.uk/product/bfh-base-unit-heater-electric> to be used for both the servery and pointing out to the proposed café area. The use of underfloor electric heating mats or overhead infrared units may be the only other possible heating solutions in this area. The underfloor electric mats are far from ideal and will serve only to take the cold surface off the floor rather than fully heat the space and should only be used when in occupation to warm the floor surface.

In all cases where the floor is being lifted and re-laid, insulation should be included in the new floor build up and any works to the roof should seek to include insulation to assist with the heating of the building.



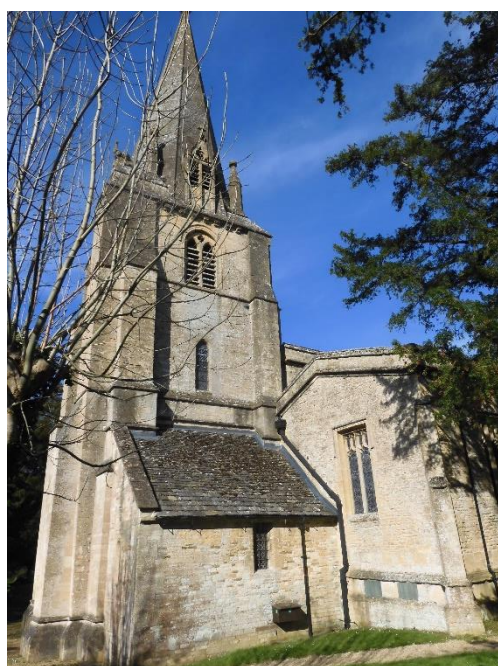
7. Renewable Energy Potential

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

Renewable Energy Type	Viable
Solar PV	Yes – potential on non-visible nave roof
Battery Storage	Yes – potential with solar PV
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 no centralised heating system
Air Source Heat Pump	No – difficult to integrate with existing building
Biomass	No – not enough heating load

There is potential for a small PV array on the roof of the tower or on the south 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 church's 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 6 to 10) 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.



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 or contact 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.



10. Other Observations



It was noted that the current floor tiles are of a type which often are found to have an asbestos content and a number of these are breaking up. It is therefore strongly advised that a sample of these tiles is sent for testing without delay so that they may be managed appropriately.

Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

Room/Location	Number of Fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
External	2	100W LED Flood	£57.68	£244.00	4.23
Chancel	6	100W LED Flood	£11.21	£732.00	65.31
Chancel	2	50W LED Flood	£1.58	£182.60	115.91
Nave	6	NO CHANGE			
South Aisle	14	GU10 LED	£18.03	£165.20	9.17
North Aisle	6	GU10 LED	£7.73	£70.80	9.17

