



Energy Audit and Survey Report

St Mary the Virgin, Iffley



"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 the Virgin, Iffley 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, Iffley is a Romanesque style church built in the 12th century, with a 13th century chancel extension and some later windows. It is considered to be one of the best preserved 12th century churches in England. Electricity only is 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?
Install draughtproofing measures to doors and windows	5% 1,100	£150	£50	<1	List B	Warden
Install LED lighting where not fitted	Up to 1,500	Up to £210	£600	3	List A/B	PCC
Install LED floodlight	800	£110	£200	2	List A	Warden

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?
Replace selected under pew bar heaters with convectors	0	0 Comfort enhancing	£1,000	N/A	List B	PCC
Install over door convector heater	May allow abandonment of underfloor heating	Potential if UFH no longer used	£1,000	Uncertain	Faculty	PCC

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?
Install radiant infrared panel heaters in appropriate areas	May allow abandonment of underfloor heating	Potential if UFH no longer used	Depends on system size (small = 2,000)		Faculty	PCC



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

Based on the current contracted price of 14.0744p/kWh (standard rate) and 10.5003p/kWh (cheap rate) for electricity.

If all short and medium term measures were implemented this would save the church around £470 in operating costs per year.



Detail of the Norman vaulting of the chancel / tower arch.



2. Introduction

This report is provided to the PCC of St Mary the Virgin, Iffley 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, Iffley, 123 Church way, Iffley, Oxford, OX4 4EG was completed on the 9th March 2020 by Dr. Paul Hamley, meeting with Rev. McKearney.

Paul is an energy auditor with experience of advising churches and small businesses. He is part of the Diocesan Environment Officers Energy Group developing advice for the Church of England and authored the "Assessing Energy Use in Churches" report for Historic England. He is a CIBSE Associate Member and a Chartered Scientist, with experience of the faculty process gained from chairing the building committee of a Grade I listed church and has been an EcoCongregation assessor.

St Mary the Virgin, Iffley	627201
Gross Internal Floor Area	168 m ²
Listed Status	Grade I
Typical Congregation Size	75

The church typically used for 6 hours per week for the following activities

Services	5 hours per week
Meetings and Church Groups	0 hours per week
Community Use	1 hour per week

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

Estimated annual hours of use: 280 hours

Estimated annual heating hours: 200 hours

Estimated annual footfall: 6,300



3. Energy Procurement Review

Energy bills for electricity have been supplied by St Mary the Virgin, Iffley and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	14.0744p/kWh	In line with current market rates
Night Rate	10.5003p/kWh	In line with current market rates
Standing Charge	17.8531p/day	N/A

The church currently procures its electricity via the Parish Buying scheme.

This scheme only offers 100% renewable energy sourced energy and therefore it is an important part of the process of making churches more sustainable.

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.

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 currently being charged.

A 20% VAT rate was charged from March 2018 to January 2019 which has been refunded.

A VAT declaration should be sent to the supplier if this re-occurs.



4. Energy Usage Details

4.1 Annual Consumption

St Mary the Virgin, Iffley uses around 25,000kWh/year of electricity, costing in the region of £3,600 per year. This supplies both the church and the vestry opposite, where the meter is located.

This data has been taken from the annual energy invoices provided by the suppliers of the site.

Utility	Annual use/ kWh	from	to	Cost
Electricity	25,666	31/07/18	31/07/19	£3,618

Utility	Meter Serial	Type	Pulsed output	Location
Electricity	S04R 34508	Actaris	Yes	Cupboard in porch next to church office and rectory.

Installation of a smart meter means that an annual energy use profile should be obtainable from the supplier.



4.2 Energy Profiling

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

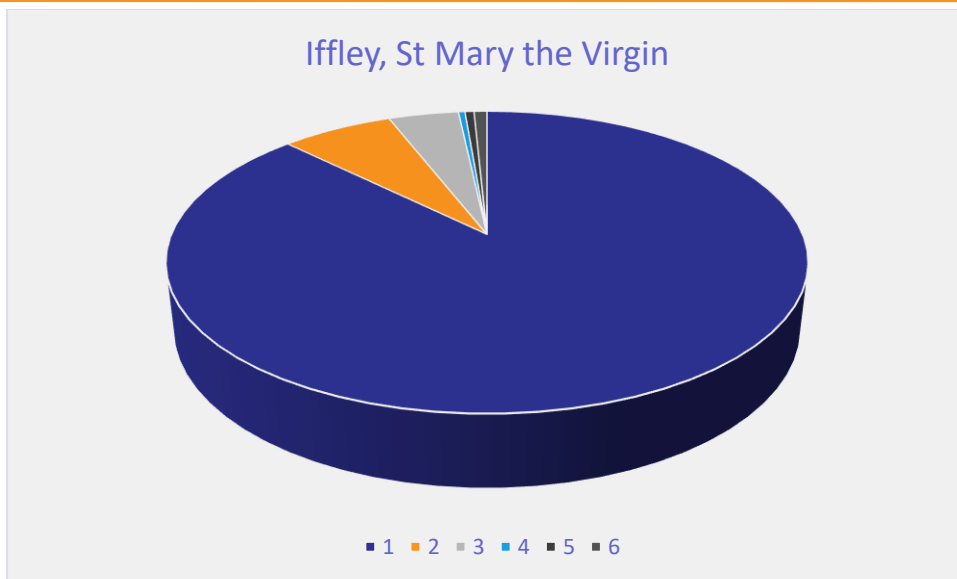
Service	Description	Power	Annual Use/ kWh	Estimated Proportion of Usage %
Lighting	Types of bulb not verified, assumed not LED			
Internal	60 spotlight bulbs	6kW	1,680	10.92%
External	1 floodlight (if 5 hours/night)	500W	900	
	1 lamp post bulb (If 5 hours/night)	100W	180	
Vestry	3 x halogen Bulbs (4 hours/week use)	220W	44	
	TOTAL		2,804	
Heating [Electric]	28 Electric underpew elements (4', 2kW) 4 elements (3', 1.5kW) 1 heater element (organ, 1kW) 8 for rear pews around font, 2kW Total 41, estimated annual use 200 hours 4 Norel 1 kW convector heaters (chancel) 4 Underfloor heating areas (three in chancel, one at font) Vestry – 2 bar heater	80kW? 4kW unknown	16,000 800 5,000	87.3%
	TOTAL		22,400	
Hot Water	Church – Zero Vestry – kettle (30 mins/week use) Water heater (occasional use)	3kW 3kW	78 22	0.4%
	TOTAL		100	
Other Small Power	Sound system Vacuum cleaner Vestry – toaster	500W 1.5kW 1kW	100 30 10	0.5%
	TOTAL		140	
Organ	Organ	1kW	200	0.8%

Total Annual Consumption 2018-19: 25,666kWh

Non heating consumption: 3,266kWh

NB: Estimating both heating equipment power and hours of use does not give reliable results – it is quite possible that the underfloor heating is the major user of power with the under pew elements having a lower power rating (or hours of use). If the church is able to calculate a more accurate hours of use figure, this can be used to work out the actual power in kW of the combined heating (given that the annual consumption is known and heating is the major component).





KEY

1 Heating 2 Internal Lighting 3 External Lighting 4 Hot Water 5 Small Power 6 Organ

4.3 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Mary the Virgin, Iffley uses an average amount of electricity for lighting, etc and 90% of electricity for heating than would be expected for a church of this size. The church is used for less hours than average, which contributes to the low figures.

	Size (m ² GIA)	St Mary the Virgin, Iffley use kWh/m ²	Typical Church use kWh/m ²	Efficient Church Use kWh/m ²	Variance from Typical
St Mary the Virgin, Iffley (electricity not for heating – 3,266kWh)	165	19.8	20	10	99%
St Mary the Virgin, Iffley (heating)	165	136	150	80	90%
TOTAL	165	155	170	90	91.5%

There is currently no benchmark data available to takes hours of use and footfall into account.

¹ CofE Shrinking the Footprint – Energy Audit 2013



5. Energy Saving Recommendations (Electricity)

5.1 Lighting (Internal)

It was not possible to identify the types of bulbs fitted due to the height, and no spares were available to view. It is recommended that LED bulbs be fitted if they are not already installed.

If the lights are required to be dimmed, LED bulbs which are compatible with the dimming mechanism are required (cheaper ones will work, but reduce the lifetime of the more expensive dimming controller).

New LED fittings have a much longer life than conventional halogen bulbs and around double that of CFL bulbs, and hence will reduce the frequency of replacement of the lamps. 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.

For the spot lights the Megaman range of LED spot (reflector) lights

<https://www.megamanuk.com/products/led-lamps/reflector/> provide some very suitable substitutes to the current lamps.

5.2 Lighting (External)

The floodlight bulb should be an LED. This will offer savings over conventional bulbs rated at 250 to 1000W. An example is shown below (Brackenheath N6060, 150W, IP65 outdoor suitable).



6. Energy Saving Recommendation (Heating)

6.1 Heating System and Strategy

The church currently uses a combination of under pew radiant bar heaters (2 inch diameter tubes) and four circuits of electric underfloor heating, installed in the 1970s, to heat the church.

All of the current heating relies on radiation to transfer heat. Underfloor systems warm up very slowly and are suited to buildings which are in regular or constant use, where they radiate gentle warmth over a large area. 3 out of 4 underfloor circuits are located in the chancel, away from where the congregation sit.

With the low hours of use of the church (it is assumed it is heated only on Sundays), a heating system which delivers heat to the congregation on demand is suggested.

One of the underfloor circuits, to the south side of the chancel has failed. Underfloor systems are known to be very expensive to install, and expensive to run as they need to be on for many hours to provide benefit. Heating the church for many hours when it is empty is an expensive strategy, it is not recommended to continue with background heating, especially as it heats the part of the church where the least people sit.

6.2 Proposals

The aim should be to create a warm zone in the centre of the church, where most people sit (and target the area where the most elderly members of the congregation sit).

It is suggested that the church consider three things:

6.2.1 Replacement of some of the under pew radiant tubes with under pew convective heaters.

Some of the radiant heat is wasted heating the underneath and backs of the pews with the current tube design. This option allows for a replacement of a few tube heaters in one area of the church by convector heaters as a trial. It may be that only a small area needs to be converted to provide a zone which is warmest for the benefit of the elderly, and the coldest periods of the year.

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.electriceheatingsolutions.co.uk/Content/PewHeating>. Any new cable runs should be in armoured cable or FP200 Gold when above ground), although the existing cabling can probably be re-used.

The opportunity to have local on/off switches under the pew for each heater should be taken.





Panel heaters (4, Norel, 1kW each) are fitted in the choir area.



The under pew heaters below 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.



6.2.2 Installation of an overdoor heater

In order to achieve the sense of a 'warm welcome' into the church an over door air heater could be provided. This would also help to provide warmth to the rear of the church including the font area. Such an over door unit should be sized to cover the whole width of the door and it is suggested the BN Thermic 860 model would be quite suitable. This has a 6kW output.

The installation would consist of a BN Thermic 860 Overdoor Fan heater above the main entrance door wired in with a BN Thermic CS-7 control switch. The unit requires single phase power. All new cabling to be run in FP200 Gold conduit.

6.2.3 Installation of some overhead radiant panels under the ceilings.

Panels rated at 500-1000W each are assumed to require lower power than the underfloor circuits. They will provide rapid heat to people, rather than slow acting heat via the stone floor surface.

The nave ceiling is rather high for such panels to be effective and also has a complex structure.

The tower (ringing room) wooden ceiling may offer a better location, being a level surface. Panels are available in bespoke colours from some manufacturers so could blend in with the wood.

High surface temperature panels (designed for warehouses) should not be fitted to wooden ceilings.





Suitable electric panel heaters would be far infrared panels such as <https://www.warm4less.com/product/63/1200-watt-platinum-white-> . Several manufacturers produce coloured panels, including Surya: <https://www.suryaheating.co.uk>

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.



6.3 Controls

A well labelled control panel is concealed at the west end of the church.



6.4 Vestry Heating Options

Low temperature far infra-red heating panels (55°C surface temperature, as used in schools) could be installed on the sloping ceiling of the vestry rooms if more rapid heating is required in these areas.



7. Energy Saving Measures (Building Fabric)

7.1 Draught Proofing to Doors

Where a timber door closes against a timber frame it is recommended that draught proofing is fitted. 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. Note this cannot be used where the timber door closes directly against a stone surround.

Other simple measures such as using a small fridge magnet painted black over the keyhole or the use of 'sausage dog' type draught excluders at the base of the little used doors which can prove to be very effective. Doors should be reviewed in daylight and gaps where the light shines through sealed or filled in whatever the most appropriate way is for the specific door.



7.2 Closed Door Policy

The door should be kept closed in cold or windy weather and quickly closed behind the arriving congregation by your friendly welcome team!



7.3 Windows

If there are draughts caused by hopper windows not shutting correctly, a temporary solution is to use black plasticine to fill gaps.



8. 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 – not sufficient demand, visible roof
Battery Storage	No – no viable 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 – no radiator system
Air Source Heat Pump	No – no radiator system
Biomass	No – not enough heating load as well as air quality issues

9. Funding Sources

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-Nov-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.



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.

11. Report Circulation

In addition to the PCC, this report is also sent to:

1. Your DAC secretary and your DEO, because
 - They maybe be able to offer you help and support with implementing your audit
 - They want to look across all the audits in your diocese to learn what the most common recommendations are.
2. Catherine Ross and team, the officer in the Cathedral and Church Buildings team centrally who leads on the environment, who wants to learn from all the audits across the country. She will be identifying cost-effective actions churches like yours might be able to make.

