Energy Audit and Survey Report

St James's Church, Finchampstead

"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	5th October 2019	1.0

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1. Executive Summary

An energy survey of St James's Church, Finchampstead 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 James's Church, Finchampstead is Grade 1 listed parish church dating back to 1134. There is only electricity supplied to the site.

The church has a number of ways in which is 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?
Continue to replace lights for LED on failure	N/A	N/A	N/A	N/A	List A	
Change to under pew heating and remove overhead units	2,002	£230	£8,840	38.37	Faculty	

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 draught-proofing to external doors	158	£18	£800	43.90	List B	
Consider installing small PV array on tower roof	1,200	£138	£1,800	13.03	Faculty	
Consider installing electric vehicle charging point in car park.	N/A	N/A	£500	N/A	TBC	

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

Based on current contracted prices of 11.51p/kWh for electricity.

If all measures were implemented this would save the church £387 per year.

2. Introduction

This report is provided to the PCC of St James's Church, Finchampstead 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 James's Church, Finchampstead, Church Lane, Finchampstead, RG40 4LU was completed on the 5th September 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.

St James's Church, Finchampstead	
Gross Internal Floor Area	353 m^2
Listed Status	Grade I
Typical Congregation Size	90 (at 11am service)

The church typically used for 14.5 hours per week for the following activities

Services	12.5 hours per week
Meetings and Church Groups (Choir Practice)	2 hours 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 James's Church, Finchampstead and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	13.36p/kWh	In line with current market rates
Night Rate	8.51p/kWh	In line with current market rates
Evening and Weekend Rate	11.51p/kWh	In line with current market rates
Standing Charge	£35.08 per quarter	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 when the current contracted rates are coming to an end (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.
FiT	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 James's Church, Finchampstead uses 10,768 kWh/year of electricity, costing in the region of £1,240 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St James's Church, Finchampstead has one main electricity meter, serial number E13Z008222.

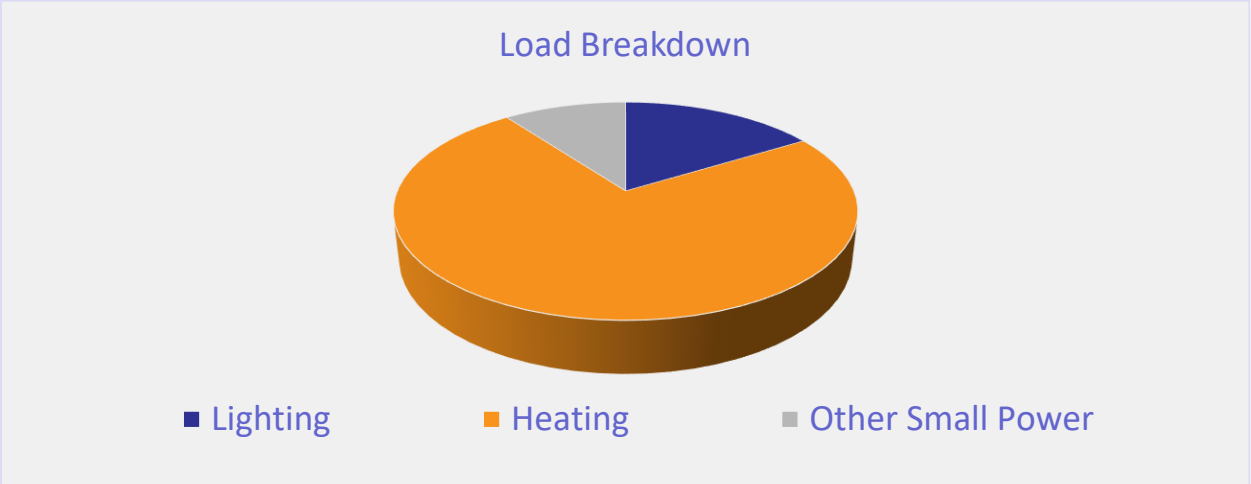
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	E13Z008222	3 phase 100A	Yes	GF elec switch room

All the meters are AMR connected and as such energy profile for the entire energy usage should be possible. Half hour meter data has not been provided for the purpose of this report but should be accessed and reviewed to examine the times when electricity is being used.

4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	Relatively modern lighting using moderately efficiency CFL and halo-saver lights.	16%
Heating	Overhead radiant heaters located on the timber wall plate within the nave and all other areas of the church	74%
Other Small Power	Power to organ, sound system and other small appliances	10%



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

4.2 Energy Benchmarking

In comparison to national benchmarks for Church energy use St James's Church, Finchampstead uses 82% less energy than would be expected for a church of this size. Note, as the church uses electricity for heating it is only relevant to consider the combined benchmark.

	Size (m^2 GIA)	St James's Church, Finchampstead use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St James's Church, Finchampstead (elec)	353	30.51	20	10	53%
St James's Church, Finchampstead (heating fuel)	353	0.00	150	80	-100.00%
TOTAL	353	30.51	170	90	-82%

The efficient performance of the church is due to the relative efficient lighting scheme installed and the electrical heating system which is used only when occupied. It is also noted that due to the issues around the timber deterioration behind the overhead heaters, the usage may have been depressed as these heaters or the church has not been used for a period of time.

5. Energy Saving Recommendations

5.1 Lighting (fittings)

The lighting makes up a notable element of the overall energy load within the building, and all areas are lit by relatively efficient fittings.

It is possible for further efficiencies to be achieved by upgrading the existing lighting to LED units.

Given that the existing lights are already of a reasonable efficiency standard it cannot be justified on energy ground alone to change the lighting immediately, instead the continued practice of changing the existing lighting for LED when units fail and require replacement is encouraged.

In order to protect the new LED lighting installation from premature failure caused by power surges from the grid (one of the main causes for early failure of LEDs) it is recommended that the church consider installing a surge protection devices onto the existing main distribution board if not already installed. (https://www.hager.co.uk/product-catalogue/energy-distribution/protection-devices/surge-protection/90399.htm)

5.2 Change to Underpew Heating

There are noted issues with the existing overhead radiant heaters. The main problem is that they are mounted directly against the timber wall plate and the heat that they give off has already caused one location to dry out and crumble. The height that they are mounted is also outside of the optimal operating range for the heaters to be effective and the pink glow that they emitted is visually unappealing.

Given the churches usage profile we would suggest that a revised heating strategy for the church would provide a more efficient use of energy and a more comfortable church. We would recommend that the eight overhead heaters to the nave and two of the units to the choir area are removed and replaced with underpew panel heaters (40 units to the nave being two under each of the 20 pews and 8 units to the choir being two under the 4 pews.)

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.electricheatingsolutions.co.uk/Content/PewHeating. Cable runs to the pew heaters could run along the North and South walls (all cabling should be in armoured cable or FP200 Gold when above ground) to the both areas of pews relatively easily.

The two overhead units to the remaining area of the side transept of the choir and the chancel could be retained although over time they may wish to be replaced for more appropriate units which do not emit a visible light such as the alpha bar units https://www.warm4less.com/p/3200-watts-alpha-bar-heater/

There is an existing electric heater behind the altar and the continued use of this heater is supported.

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 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.

A simple use of a fridge magnet over the large keyhole may also help to reduce draughts!

http://www.theenergysavers.co.uk/application/files/1714/7197/4194/National_Trust_Case_Study.pdf

6. Other Recommendations

6.1 Electric Vehicle Charging Points

The church has a car park to which serves the church and also the frequently used church building and leased flats within the house behind. In order to make a visible statement on the churches mission of stewardship and to facilitate more sustainable transport choices by those both visiting the church and using the hall, the church may wish to consider installing an electric vehicle charging point with the car park to allow visitors to church and the meeting rooms as well the residents to charge their electric car.

There are various grant scheme available to part fund the installation of electric vehicle chargers as well as token or key operated units which may help to ensure some form of controlled use of the users of the church and the churches property behind.

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 – on tower roof
Battery Storage	Yes – within tower
Wind	No – not a suitable site
Micro-Hydro	No – no water course
Solar Thermal	No – no hot water demand
Ground Source Heat Pump	No – would not integrate well with the church's usage or fabric
Air Source Heat Pump	No – as GSHP
Biomass	No – does not suit the nature of usage of the church or its installed systems and has air pollution issues.

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. 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 although domestic scale battery storage units are now becoming mainstream.

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 at 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

The church owns a large house behind the church which is used in part for meeting rooms which are hired out as well as residential units which are let. The energy saving potential within this building will be far greater than that within the church and the PCC should consider reviewing the energy usage and energy saving measures within this building as well as within the church.