Energy Audit and Survey Report

St Francis' Church, Langley

"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	26th July 2019	1.0

© Inspired Efficiency Ltd

Contents

1. Executive Summary

An energy survey of St Francis' Church, Langley 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 Francis' Church, Langley is a relatively modern church having been built in 1960/1 originally as a church hall before being used as a place of worship. There is both gas and electricity supplied to the site and the gas heating boiler has been recently upgrade to a modern condensing boiler.

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?
Install foil backing behind radiators	1,049	£60	£200	3.32	List A	
Re procure energy contracts	n/a	£1,000	Nil	Immediate	None	
Fit insulated board to rear of store under stage and seal around edges	2,799	£161	£600	3.74	List B	

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?
Change existing lighting for low energy lamps/fittings	1,589	£272	£1,839	6.75	List B	
Install PIR motion sensors on selected lighting circuits	25	£4	£12	2.79	List B	
Install Endotherm advanced heating fluid into heating system(s)	3,498	£201	£232	1.16	List A	
Fit 270mm of insulation into the loft, insulate between rafters of side ceilings and board over.	5,247	£301	£6,000	19.92	Faculty	
Rebate draught seal around main front doors	700	£120	£800	6.67	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?
Vestry - block up external door, replace window with double glazed unit, insulate ceiling.	Comfort	n/a	£1,200	n/a	Faculty	
Replace porch door and insulate ceiling.	Comfort	n/a	£1,800	n/a	Faculty	
When kitchen is refurbished, install under plinth heating from boiler, block up old vent fan and use cooker hood extract only. Install only A++ fridge and other appliances	Note only					

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 and 5.74p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,119 per year. (this does not include the savings from obtaining better energy contracts)

2. Introduction

This report is provided to the PCC of St Francis' Church, Langley 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 Francis' Church, Langley is a relatively modern urban church having been built in 1960/1 originally as a church hall before being used as a place of worship.

An energy survey of the St Francis' Church, Langley, Upton Court Road, Slough, SL3 7NE was completed on the 27th June 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 Francis' Church, Langley	
Gross Internal Floor Area	200 m^2
Listed Status	Unlisted
Typical Congregation Size	40

The church typically used for 46 hours per week for the following activities

Services	6 hours per week
Meetings and Church Groups	5 hours per week
Community Use	35 hour 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 gas and electricity have been supplied by St Francis' Church, Langley and have been reviewed against the current market rates for energy.

The current electricity rates are:

Single / Blended Rate	17.14p/kWh	Above current market rates
Standing Charge	42.42p/day	N/A

The current gas rates are:

Single / Blended Rate	5.74p/kWh	Above current market rates
Standing Charge	118.03p/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 gas and 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.

4. Energy Usage Details

St Francis' Church, Langley uses 2,632 kWh/year of electricity, costing in the region of £451 per year, and 41,156kWh/year of gas, costing £2,362.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Francis' Church, Langley has one main electricity meter, serial number K90C59569. There is one gas meter serving the site, serial number 3586551S.

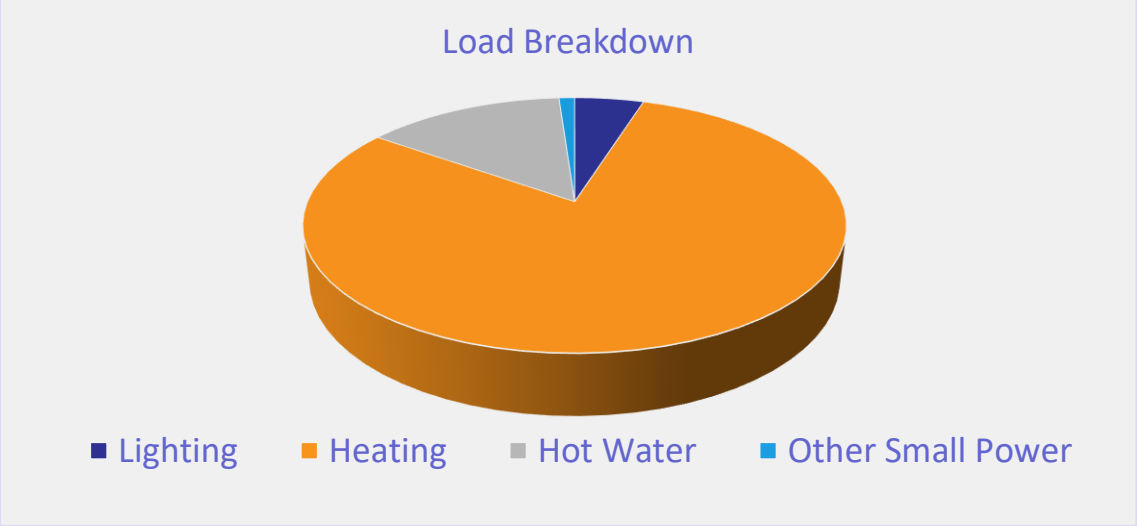
Utility	Meter Serial	Type	Pulsed output	Location
Electricity	K90C59569	3 phase 100A	No smart meter connected	Side of stage
Gas	3586551S	UGI R5	No smart meter connected	Entrance area

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	Mainly fluorescent T8 lighting and 2D fittings throughout with newly refurbished WC areas being LED.	5%
Heating	New gas condensing boiler providing heating to radiators throughout.	80%
Hot Water	Hot water provided from gas combi boiler	14%
Other Small Power	Power for kitchen appliances and the like	1%



As can been 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 Francis' Church, Langley uses 34% less electricity and 37% more heating energy than would be expected for a church of this size.

	Size (m^2 GIA)	St Francis' Church, Langley use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Francis' Church, Langley (elec)	200	2,632	13.16	20.00	-34%
St Francis' Church, Langley (heating fuel)	200	41,156	205.78	150.00	37.19%
TOTAL	200	43,788	218.94	170.00	29%

Some of the additional heating use can be attributed to the higher than normal hours of use this building has due to its lettings but it is interesting to note that this has not impacted on the electrical usage. The main reason the heating use is high is due to the issues with the building fabric and cold draughts which can be improved.

5. Energy Saving Recommendations

5.1 Lighting (fittings)

The lighting makes up a relatively small overall energy load within the building, but areas are lit by inefficient fittings. The main church area is lit by old T8 fluorescent strip lights (as is the kitchen) and other areas are lit by 2D fittings. New LED fittings for this type of lighting is widely available on the market and it is suggested that the complete fitting (not just the lamp) is replaced. Any new LED fitting would have a much longer life and hence reduce the need to replace the lamps in the ceiling.

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

If all the lights were changed the total capital cost (supplied and fitted) would be £1.839. The annual cost saving would be £272 resulting in a payback of around 6.75 years.

5.2 Lighting (control for internal lights)

There are several lights which could currently remain on all the time that the building in areas such as corridors, toilet areas, porch and the like. Some of these areas are only used occasionally and for a short amount of time and as such, the light does not need to remain on constantly. There are also spaces which benefit from a good amount of natural daylight coming in through the windows where artificial lighting is not required for much of the year during the day.

It is recommended that a motion sensor is installed on these specific lighting circuits so that the lights come on only when movement is detected in the space and turn off approximately two to five minutes after the last movement has been detected (note that the duration of the time lag after which the light goes off needs to be consider alongside the type of light that is fitted. LED lights are much more suited to being switched off after only a short duration than some fluorescent lights). These movement sensors (commonly called PIRs) also have light sensors integrated into them so they can be used to make sure that the light does not come on if there is already sufficient daylight in the space.

Your existing electrician or any NICEIC registered electrical contractor can install PIR sensors onto existing lighting circuits. This can be carried out without significant disruption to the use of the space but the works will be most cost effectively carried out with the lighting replacement noted above.

5.3 Endotherm Advanced Heating Fluid

In order to improve the efficiency of the heating system further it is recommended that an advanced heating fluid (http://www.endotherm.co.uk/) is added to the heating system.

This fluid in in addition to and complements any existing inhibitors in the heating system and is added in a similar way. The fluid works to improve the ability of the boiler to transfer heat into the heating system and for the radiators and other heating elements to give out their heat into the rooms. It does this by reducing the surface tension of the water and increasing its capacity to transfer and hold heat. Case studies have demonstrated that the addition of this fluid into heating systems reduces heating energy consumptions by over 10% as well as helping the building heat up quicker.

5.4 Foil Backing to Radiators

The external walls of the church are solid walls and would be difficult to upgrade without having a significant impact on the building. In order that was much of the heat for the radiators is usefully emitted into the building it is recommended that reflective panels are fixed behind the radiators. Panels such as https://heatkeeper.co.uk/ are widely available and can be installed as a DIY project. The cost of purchasing such panels could be an ideal item to fund form the grant available following this audit.

5.5 Roof Insulation

The roof will be a large source of heat loss from the building. There is a flat section at the top of the roof which can be accessed and quilt insulation laid on top. To the side ceilings it is recommended the insulation is applied between the rafters from below and then a flat board is fixed over the top of the rafters and finished. This will leave the trusses exposed and create an insulated roof.

5.6 Draught Sealing

The building suffers from significant air leakage from draughts within the building fabric. There are some areas such as above louvre in the loft, which have large holes which should be filled.

One significant area of cold draughts reported by the church was coming from underneath the stage area. Having examined this area, it would be possible for an insulated board to be installed and sealed in place at the rear first storage bay. This would seal off the front part of the timber stage structure within the heated part of the church and the rear (unheated) element would remain ventilated from the existing ventilation. It is likely that this measure will have a significant benefit on the thermal comfort of the building and the PCC is encouraged to progress this item during the coming winter so that its impact can be assessed.

The main front door would also benefit from draught stripping being installed all around the four sides of its closing edges. This could be carried out by a competent joiner who will be able to rebate suitable draught strips into the existing door in a way that is nonvisible once when the door is closed.

5.7 Other Fabric Measures

The church can consider the refurbishment to two areas of the building that would improve the building and the energy performance.

To the vestry the church can consider refurbishing this area by blocking up the unused doorway, replacing the existing window with a double-glazed unit (or the same style as used elsewhere within the church) and also taking down the existing ceiling and installing insulation before replacing and redecorating the ceiling.

To the main front porch similar works can be undertaken to the ceiling and the main door should be replaced for a unit with good thermal properties and draught seals.

6. Other Recommendations

6.1 Kitchen Refurbishment

It is reported that the kitchen is due to refurbishment in the near future. The existing kitchen has a large through wall fan which is resulting in a large amount of cold air entering the building. This is largely unnecessary. It is therefore suggested that this fan should be removed and blocked up as part of the kitchen works and to ensure adequate ventilation a cooker extract hood should be installed which can be used when required. To heat the kitchen space, it is suggested than under plinth ‘kick space’ heaters could be used run off the existing boiler. When specifying the new kitchen care should be taken to specify only high energy rated appliances such as a A++ fridge.

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
Battery Storage	Yes
Wind	No – not a suitable site
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water needs
Ground Source Heat Pump	No – not currently viable given existing heating system and usage.
Air Source Heat Pump	No - not currently viable given existing heating system and usage – could become viable when existing heating system requires replacement.
Biomass	No – air pollution issues.

A small PV array on the roof of this unlisted church would be viable however as the feed in tariff has now ended PV systems are only viable if the vast majority of the energy it generates is used on the site (rather than exported). This church does have regular community use but a very low electrical consumption. A small array of around 6 panels may be viable and the viability would be increased if a small battery storage unit was installed with this which could then result in the church being largely self-sufficient for electricity.

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.

Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

Room/Location	Number of Fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
Vestry	2	Virgo 8W (110m dia)	£9.31	£86.34	9.27
Porch	1	Virgo 8W (110m dia)	£4.66	£43.17	9.27
Main worship space	9	5ft Single LED	£81.77	£843.30	10.31
Rear lobby	1	Virgo 8W (110m dia)	£4.66	£43.17	9.27
Old male WC	2	Virgo 8W (110m dia)	£9.31	£86.34	9.27
Front entrance	2	Virgo 8W (110m dia)	£9.31	£86.34	9.27
WC	6	NO CHANGE			
Kitchen	1	5ft Single Vapour LED	£21.12	£80.89	3.83
Rear stage room	5	Virgo 8W (110m dia)	£39.36	£215.85	5.48
Rear stage room	2	NO CHANGE			