



Energy Audit and Survey Report

St Giles Church, Chalfont



"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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Contents

1. Executive Summary.....	3
2. Introduction	4
3. Energy Procurement Review.....	5
4. Energy Usage Details.....	6
4.1 Energy Profiling	6
4.2 Energy Benchmarking	7
5. Energy Saving Recommendations.....	8
5.1 Lighting (fittings)	8
5.2 Endotherm Advanced Heating Fluid	8
5.3 Controls.....	9
5.4 Quattro Seal	10
6. Other Recommendations.....	10
6.1 Boiler Replacement.....	10
7. Renewable Energy Potential	11
8. Funding Sources	12
9. Faculty Requirements	12
Appendix 1 – VAT Declaration Form.....	13



1. Executive Summary

An energy survey of St Giles Church, Chalfont 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 Giles Church, Chalfont is Grade 1 listed medieval parish church dating back to 1180. 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.

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 Endotherm advanced heating fluid into heating system(s)	6,037	£160	£480	2.99	List A	
Optimise heating control settings	7,102	£334	£600	1.79	None	
Advise energy suppliers of charitable status by completing a VAT declaration	None	£850	Nil	-	None	

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	5,700	£819	£5,156	6.30	List A/B	
Fit Quattro seal draft proofing to historic doors	1,207	£173	£800	4.61	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?
Consider installing a small PV array on the tower roof					Faculty	
Plan to replace boilers with modern condensing boiler when the existing ones fail					List B / Faculty	



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

Based on current market prices of 14.364p/kWh and 2.656p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,487 per year.

2. Introduction

This report is provided to the PCC of St Giles Church, Chalfont 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 Giles Church, Chalfont, The Green, Chalfont St Giles, HP8 4QF, Bucks was completed on the 28th August 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 Giles Church, Chalfont	
Gross Internal Floor Area	232 m ²
Listed Status	Grade I

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

Services	7 hours per week
Meetings and Church Groups	7.5 hours per week
Community Use	-

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 Giles Church, Chalfont and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	14.36p/kWh	In line with current market rates
Night Rate	9p/kWh	In line with current market rates

The current gas rates are:

Single / Blended Rate	2.66p/kWh	In line with current market rates
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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. When the current contracts come to an end we would 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	20%	The church is a charity and therefore should be benefiting from only be charged a 5% VAT rate. A VAT declaration should be sent to the supplier to adjust this.
CCL	100% charged	As the organisation is being charged the wrong VAT rate, they are also being charged CCL which should not be applied as they are a charitable organisation. Sending the supplier a VAT declaration will remove this charge.

The above review has highlighted that VAT and CCL are being charged when the church is a charity and have VAT exemption status. As such the PCC of St Giles Church, Chalfont should send the both the gas and electricity suppliers at VAT declaration (see Appendix 1) confirming this and seek a VAT and CCL refund going back for the past 3 years.



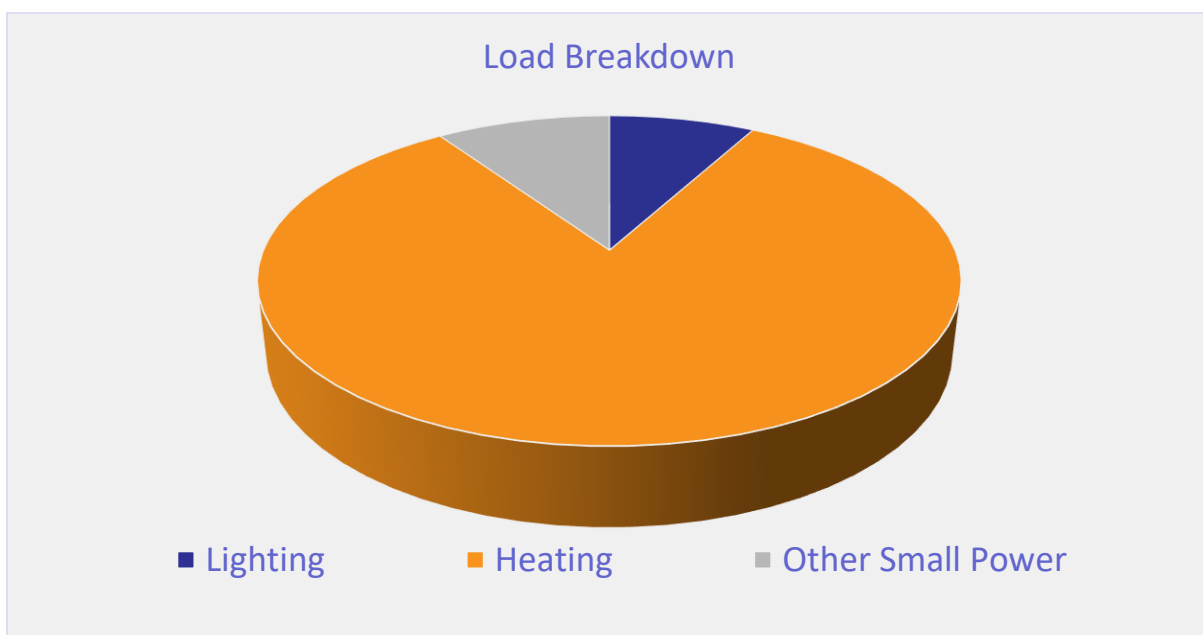
4. Energy Usage Details

St Giles Church, Chalfont uses 15,107 kWh/year of electricity, costing in the region of £2,170 per year, and 71,020kWh/year of gas, costing £1,890. This data has been taken from the annual energy invoices provided by the suppliers of the site.

4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	AR111 spotlights throughout	8%
Heating	Gas condensing boilers serving radiators throughout church	82%
Other Small Power	Sound system, organ, kitchen appliances and the like	10%



As can be 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 Giles Church, Chalfont uses 225% more electricity and 103% more heating energy than would be expected for a church of this size.

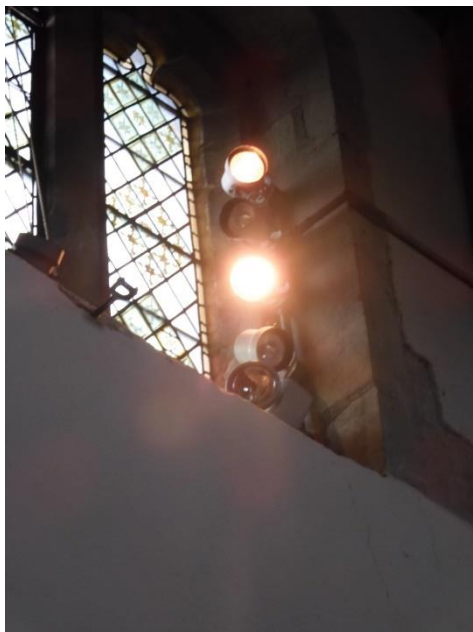
	Size (m ² GIA)	St Giles Church, Chalfont use kWh/m ²	Typical Church use kWh/m ²	Efficient Church Use kWh/m ²	Variance from Typical
St Giles Church, Chalfont (elec)	232	65.04	20	10	225%
St Giles Church, Chalfont (heating fuel)	232	305.78	150	80	103%
TOTAL	232	370.83	170	90	118%

This church uses far more energy than it would be expected to use. As the reported hours of use are not unusually long this suggests that lighting and heating is remaining on for periods when the church is not in use. The heating controller should be carefully checked to ensure it is only on for occupied hours and there is no background heating left on and the lighting should be checked to ensure that background lights are not left on unnecessarily.



5. Energy Saving Recommendations

5.1 Lighting (fittings)



The lighting makes up a considerable part of the overall electrical load within the building and the whole church has had a new lighting system installed some years ago which used AR111 Halogen lamps with an extensive lighting control system that dims the lights to various scenes.

While this is a comprehensive and impressive lighting scheme it could be questioned whether it is more sophisticated than the church actually needs.

The dimming rack may limit the possibilities to change the existing lighting to LED which would be recommended. Replacement LED lamps are available that would fit into the existing fittings and can be dimmed. Philips produce a suitable lamp <https://www.lighting.philips.co.uk/prof/led-lamps-and-tubes/led-spots/master-ledspot-lv-ar111> with a wide range of options which would fit well within the church.

Changing all the lamps to LED may mean that the load of the lighting circuit drops below the operating range of the dimmer rack and that the type of dimming (trailing or leading edge) needs to be changed. Advice should be sought from the lighting control installation/maintenance company on what adjustments may be required to the existing dimming rack to allow this.

These replacement AR111 lamps can be purchased widely for around £15 a unit, the costs include in the summer table include an allowance for fitting. Many of the lights could be self-installed and therefore cost much less than the supply and fit cost above. In this case the £150 grant available through this process could be very usefully employed to fund the purchase of replacement of 10 LED lamps on a trial basis which the church installs themselves.

5.2 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 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.

Endotherm can be self-installed.

5.3 Controls



The energy consumption levels suggest that the heating (and possibly lighting) controls are set at levels which mean that energy is being consumed when the church is not being used.

It is likely that a background level of heating is being maintained within the church and this should be avoided or drastically reduced. The church dates back to the 12th century and would not have had any form of heating for its first 700 years, as such the fabric does not require

background levels of heating and in many cases such background heating can be detrimental to the fabric. Heritage England and National Trust both now do not recommend or use background heating in the majority of circumstances. If a background level is being used this should either be removed or reduced to a level of 10°C to 12°C only.

If lights are being left on for visitors during the day the extent of these should be very carefully reviewed and reduced to the minimum possible. It should be these lights which are prioritised for replacement to LED and it could be that the 'visitor lights' circuits have their dimming removed or changed to accommodate a low energy LED replacement while a longer-term solution is developed for the other lighting.



5.4 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. Other Recommendations

6.1 Boiler Replacement

The two existing church boilers do not represent the most efficient units on the market but still have some life left in them. It is not recommended to replace them early to improve the efficiency (as the carbon emissions involved in manufacturing the new boilers and disposing of the old would negate any efficiency savings from the gas usage) but when these boiler start to fail they should be replaced with the most energy efficient condensing gas boilers available on the market at the time. This is likely to see an efficiency improvement of 10% to 15% on the current boilers.



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 – to tower roof
Battery Storage	Yes – small domestic system only
Wind	No – not a suitable site
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water needs
Ground Source Heat Pump	No – difficult to integrate into existing building and buried church yard
Air Source Heat Pump	No – does not suit fabric and existing systems
Biomass	No – little benefit over mains gas, air pollution and fuel delivery issues.

There is potential for a small PV array on the roof of the tower or 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 relatively low and the consumption during the daytime when the sun is shining is likely to be minimal (depending on the visitor lighting arrangements), therefore while technically viable only a very small number of panels (maximum of around 4 to 6) 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 a domestic scale battery storage system would be worth considering as these are now reaching mass market conditions.



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.





VAT Declaration Form

**CERTIFICATE TO SUPPLIER OF NATURAL GAS IN RESPECT OF PREMISES
QUALIFYING FOR VAT AT 5%**

This form is required to be completed in full in order to be validated

Company Name	
Account Number	
Contact Name	
Email Address	
Address of Qualifying Premises	
VAT Registration Number (If Registered)	
Registered Charity Number (If Applicable)	
Meter Details Please provide MPRN(s) relevant to this declaration. If you need additional space, please attach a separate sheet signed and dated by the same person completing this form. ***Please note that one form per fuel, per property is required***	
Percentage of total consumption qualifying for the reduced rate of VAT:	
Classification of Claim (Please tick): Domestic use: <input type="checkbox"/> Charitable non-business use: <input type="checkbox"/>	
Nature of Business and further details of your claim:	
I certify that the above information given is accurate and will remain valid until I inform Crown Gas and Power that there has been a significant change in circumstances. I understand that any incorrect statement may make me liable to pay a financial penalty under the VAT Act 1994.	
Signature	
Date	
Full Name & Position	
Telephone Number	

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