Energy Audit and Survey Report

Holy Trinity, Sunningdale

Diocese of Oxford

"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	27th February 2019	1.0

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1. Executive Summary

An energy survey of Holy Trinity, Sunningdale was undertaken by Inspired Efficiency Ltd to provide advice to the church on how it can be more energy efficiency and provide a sustainable and comfortable environment to support its continued use.

Holy Trinity, Sunningdale is a Victorian Grade II listed church built in 1839 and significantly adapted in 1887. There are future reordering plans to remove pews and have underfloor heating to the nave. There is only electricity supplied to the site.

The church as 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?
Change existing lighting for low energy lamps/fittings	10,396	£1,557	£3,562	2.29	List A/B	
Install PIR motion sensors to WC	13	£2	£40	19.95	List B	
Install SavaWatt devices on fridges and freezers	280	£42	£100	2.38	List A	
Fit draught proofing to external doors	1,040	£156	£1,500	9.63	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?
Improve air curtain above main entrance door	Improve Comfort	-	£1,400	-	List B	
Insulate and board office roof	Improve Comfort	-	£8,000	-	Faculty	

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 roof insulation with any re-roofing works	5,200	£779	With roof works	N/A	With roof works (List B)	

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

Based on current contracted prices of 14.98p/kWh for electricity.

If all measures were implemented this would save the church £2,536 per year.

2. Introduction

This report is provided to the PCC of Holy Trinity, Sunningdale 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.

Holy Trinity, Sunningdale is a Victorian, Grade II listed church built in 1839 and significantly adapted in 1887. It houses a parish office and has regular community lettings and therefore there is frequent and regular usage. There are future reordering plans to remove pews and have underfloor heating to the nave.

An energy survey of the Holy Trinity, Sunningdale, Church Road, Sunningdale, Berkshire, SL5 0PD was completed on the 5th December 2018 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.

Holy Trinity, Sunningdale	
Gross Internal Floor Area	750 m^2 (estimated)
Listed Status	Grade II
Typical Congregation Size	Not Stated

The church typically used for 39 hours per week for the following activities

Services	7 hours per week
Meetings and Church Groups	6 hours per week
Community Use	6 hours per week
Other	20 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 Holy Trinity, Sunningdale and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	14.98p/kWh	In line with current market rates
Night Rate	12.58p/kWh	In line with current market rates
Standing Charge	26.59p/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 on renewal (31st August 2020) 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.

4. Energy Usage Details

Holy Trinity, Sunningdale uses 74,123 kWh/year of electricity, costing in the region of £11,104 per year.

This data has been taken from reviewing one monthly energy invoice provided by the suppliers of the site and then using this to calculate the estimated annual consumption. Holy Trinity, Sunningdale has one main electricity meter.

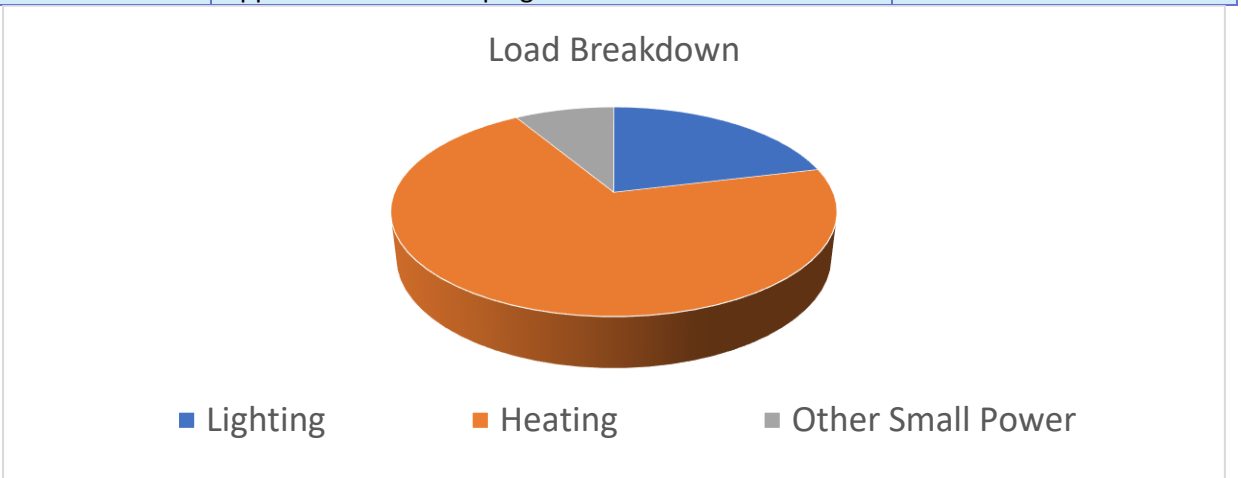
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	-	3 phase 200A	N but capable	Basement elec intake room

The electricity meter is not providing automatic meter readings. As this is the only energy meter on site it is recommended that contact is made with the electricity supply company to ask if the meter could be upgraded to a smart meter to allow closer monitoring of the actual usage.

4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	A mixture of SON flood lighting, high level PAR spot lights and chandeliers to the side aisles	21%
Heating	A relative modern electrical heating system using a mixture of fan assisted storage heaters for background heat and electric panel heaters for boosting heating levels	70%
Other Small Power	Office appliances in the parish office, kitchen appliances and other plug in loads	9%



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 the lighting.

4.2 Energy Benchmarking

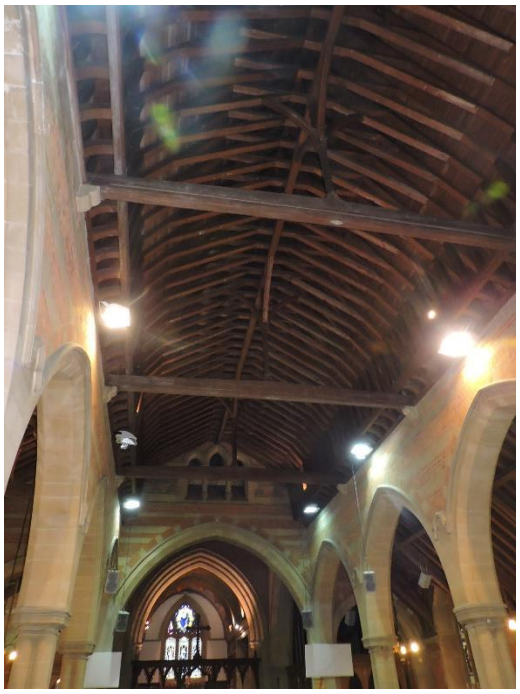
In comparison to national benchmarks for Church energy use Holy Trinity, Sunningdale uses 62% more electricity than would be expected for an electrically heated church of this size.

	Size (m^2 GIA)	Holy Trinity, Sunningdale use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
Holy Trinity, Sunningdale (elec including heating)	750 (assumed)	98.83	61	44	+62%

Most electrically heated churches adopt a system which just heats the church for the services and does not have any background heating. As the hours of usage and style of use at this church is more frequent and regular than most, some element of background heating could be considered as sensible although lowering the temperature and operational times of this could result in some energy savings.

5. Energy Saving Recommendations

5.1 Lighting (fittings)



The lighting makes up a significant amount of the energy load within the building, and large areas are lit by relatively inefficient flood and PAR 38 spot light fittings.

There has been some use of LED lighting within the church, but this has mainly been limited to replacing units which have failed.

The lights to the chandeliers in the side aisles and porch are already compact fluorescent versions but these could be changed for LED units to deliver better light output and lower energy consumption. A lamp such as https://www.simplyled.co.uk/product/crompton-high-output-17-5w-e27-gls-led-dimmable-warm-white/ may be quite suitable.

For the floodlight units, a like for like replacement could be made with an LED flood; care should be taken to ensure the right colour temperature of the light, and something between 3000K and 4000K is recommended. A fitting such as https://www.ledkia.com/uk/buy-serie-slim-superslim/3629-black-50w-led-slim-glass-projector-spotlight.html has a good slim profile and a colour in the ideal range.

The up-lighting spots to the nave roof could be questioned as to whether or not they serve a useful purpose and could be removed.

All the lights are listed in Appendix 1. If all the lights were changed the total capital cost (supplied and fitted) would be £3,562. The annual cost saving would be £1,557 resulting in a payback of around 2.3 years.

5.2 Lighting (control for internal lights)

There is a light to the WC which currently could remain on all the time.

It is recommended that a motion sensor is installed on to this area 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.

5.3 Refrigeration Controls

There is a refrigeration unit the rear of the nave and a further one in the vestry. These units run 24/7 and contribute to the baseload electrical consumption of the building.

To reduce the electrical consumption of these appliances it is recommended that they are all fitted with a SavaWatt unit. These units work by automatically detecting the load of the compressor and turning down the power when it is not in full load. This reduces the energy consumption of the refrigeration unit by around 18% while maintaining the cooling of the appliance. It does this by reducing the voltage delivered to the unit when it is idling but allowing the full energy to the unit when it is required.

Supply and installation these units and further details can only be undertaken by SavaWatt directly http://savawatt.com/.

5.4 Draughtproofing to External Doors

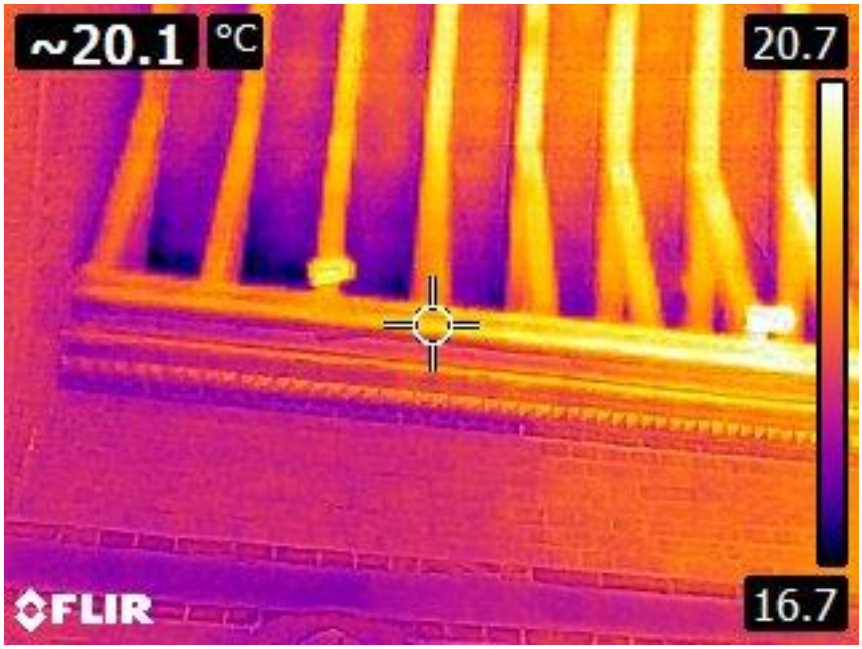
The main entrance door has a useful porch area, but the outside door is usually held open in order to provide a welcoming arrival to the church. This means that the internal, more modern, door is providing the barrier to the cold air entering the church. This door currently has worn and poor draught stripping and a gap between the doors as well as around the top, base and side is evident. As the current heating system is relying on retaining warm air inside the church it is very strongly recommended that the draught stripping and adjustment of this door is carried out to ensure a much better level of air tightness in this area.

There are other more historic doors within the church such as the door to the vestry. These too can have their draught proofing improved by using the Quattroseal system (http://www.theenergysavers.co.uk/) which is suitable for historic and listed buildings.

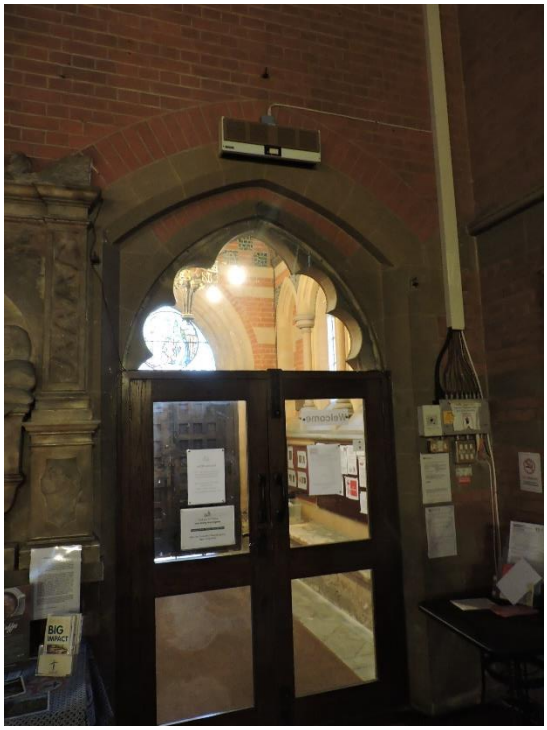
5.5 Roof Insulation

Again, as the churches heating system relies upon retaining warm air within the church any insulation to the fabric will be beneficial. Adding insulation to any future re-roofing works is advised and even if the thickness of the roof structure does not allow this to occur using products such as TLX Gold http://www.tlxinsulation.co.uk/tlx-gold/tlx-gold.aspx will help to improve the roofs thermal qualities.

The office space is the most frequently used space and has higher requirements on comfort levels that the rest of the building. There is a trussed roof with exposed rafters and the church may wish to investigate whether it would be possible to insulate between the rafters and board over then leaving only the main timber trusses exposed to improve the comfort within that space. It is noted that there is currently cold air coming in around the base of the roof at the wall plate which may also be contributing to the poor thermal environment in the office and would be solved by insulating and boarding over the rafters. This would require a faculty and an early discussion with the DAC would be advised.



5.6 Overdoor Air Heater



The main entrance door currently has a heater installed above it on the internal face of the nave wall. The current heater is far too small to be effective as it needs to cover the full width of the door. While not an energy saving measure, it is recommended that this existing heater is replaced for a larger unit which covers the whole of the door and a unit such as the BN Thermic 800 Series – 9kW would serve the purpose well. http://www.bnthermic.co.uk/products/fan-assisted-heaters/800-series/ As this is a replacement for an existing unit this could be dealt with as a List B application.

6. Other Recommendations

6.1 Electrical Circuits

It was advised that the church experiences issues that it cannot have both the storage heaters and the panel heaters on at the same time and therefore struggles to effectively heat midnight mass and other such services. There are also issues with overloading the small power circuits to the office area. As there is a large 200A 3 phase incoming supply, there should not be an issue with the overall electrical supply capacity to the church which is more than sufficient to deal with both these heating elements being on simultaneously.

It is advised that an electrician is asked to inspect the cable and fuse sizes within the distribution board by the organ as a relatively simple upgrade of the breaker sizes, or a slightly more involved increase in cable sizes and adjusting the layout of the existing ring mains should be able to solve these issues.

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	No – Visible roofs
Battery Storage	No – No viable PV
Wind	No – No suitable land
Micro-Hydro	No – No water course
Solar Thermal	No – no significant hot water demand
Ground Source Heat Pump	No - archaeology
Air Source Heat Pump	Yes - but no need with current heating system
Biomass	No – no existing wet heating system and issues with storage and deliveries

Given that all the roofs are highly visible and the other attributes of this church there are no renewable energy generation measures that are considered feasible to consider at the current time.

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 for works which ca 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 log 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
Office - spot	2	PAR 38 LED	£75.16	£42.98	0.57
Office – small flood	4	50W LED Flood	£80.20	£365.20	4.55
Office – large flood	1	50W – 100W LED Flood	£57.72	£122.00	2.11
Vestry - spots	13	NO CHANGE			
WC	2	2D LED 11W	£15.43	£109.10	7.07
Porch - chandelier	4	LED GLS	£14.00	£42.00	3.00
Nave - chandelier	22	LED GLS	£76.99	£231.00	3.00
Nave – large floods	13	100W LED Flood	£750.37	£1,586.00	2.11
Nave – spots to roof and other areas	9	PAR38 LED or remove	£331.65	£193.41	0.58
Nave	1	50W LED Flood	£9.48	£91.30	9.63
Chancel – spots to altar and rood screen	7	GU10 LED	£108.45	£82.60	0.76
Chancel – LED floods	4	NO CHANGE			
Chancel – Older floods	4	50W LED Flood	£37.91	£365.20	9.63