Energy Audit and Survey Report

All Saints, Ascot Heath

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	1st March 2019	1.0

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1. Executive Summary

An energy survey of All Saints, Ascot Heath 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.

All Saints, Ascot Heath is a large Victorian Church (consecrated in 1864) of mainly brick construction. There is both gas and 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	5,885	£859	£2,607	3.03	List B	
Install Endotherm advanced heating fluid into heating system	4,747	£165	£736	4.47	List A	
Reduce background temperature set point to 12 degrees	8,377	£291	Nil	Immediate	List A	
Adjust existing timer on external lighting	1,245	£182	Nil	Immediate	List A	

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 Quattroseal draft proofing to historic doors	949	£139	£800	5.77	List B	
Change 3nr column radiators to elec panel heaters in lady chapel for mid weeks	3,797	£134	£1,100	8.35	List B	
Insulate around floor ducts in chancel	949	£33	£300	9.11	List A/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 14.60p/kWh and 3.47p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,799 per year.

2. Introduction

This report is provided to the PCC of All Saints, Ascot Heath 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.

All Saints, Ascot Heath is a Grade II listed Victorian Church dating back to 1864. It is built from a solid wall brick construction with stone surrounds and has a pitched clay tiles roof with exposed roof timbers internally. It is heated via a gas boiler with underfloor pipework and heaters beneath floor grilles and cast-iron column radiators throughout. The church is currently maintained to a background heating levels of 15°C and has a single phase 100A electricity supply serving internal and external lighting and other small power needs.

An energy survey of the All Saints, Ascot Heath, London Road, Ascot SL5 8DQ was completed on the 29th February 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.

All Saints, Ascot Heath	
Gross Internal Floor Area	312 m^2
Listed Status	Grade II

The church typically used for 20 hours per week for the following activities

Services (2 mid-week and 2 Sunday services)	10 hours per week
Meetings and Church Groups (choir practice, piano lessons etc.)	6 hours per week
Community Use	4 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 gas and electricity have been supplied by All Saints, Ascot Heath and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	13.83p/kWh	In line with current market rates
Night Rate	11.00p/kWh	In line with current market rates
Standing Charge	25p/day	N/A

The current gas rates are:

Single / Blended Rate	Unknown p/kWh	See note below
Standing Charge	Unknown p/day	N/A

The above review has highlighted that the current rates being paid are broadly in line with current market levels but there is no financial benefit being gained when compared to typical prices seen from green tariff providers. 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.

There is a significant issue with the gas billing. The church has not been billed for gas consumption since sometime around May 2017. The recorded meter readings on the bills is 58,886m^3 where as the actual reading on the meter at the time of the audit was 75,393.88m^3. It would therefore appear as if the church has not been billed for 16,507.88m^3 of gas consumption over a 2-year period and this amounts to around 182,885kWh of gas. It is recommended that the church allows the sum of £6,345 in its accounts to cover the potential back billing of the gas meter.

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

All Saints, Ascot Heath uses 10,407 kWh/year of electricity, costing in the region of £1,520 per year, and 55,8445 kWh/year of gas costing £1,950.

This data has been taken from the annual energy invoices provided by the suppliers of the site for electricity and estimated based on the average daily gas consumtpion detailed on one earlier gas bill for the gas. All Saints, Ascot Heath has one main electricity meter, serial number E14UP07273. There is one gas meter serving the site, serial number M025A0535410D6.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	E14UP07273	1 phase 100A	Yes	In main entrance area of church
Gas – Church	M025A0535410D6	MDA25	Yes	External gas meter cupboard by boiler room step
Electricity – Hall	E15UP04046	1 phase 100A	Yes	In hall store room
Gas - Hall	G4K00170321701	BK-G4M	Yes	In meter box to side of hall.

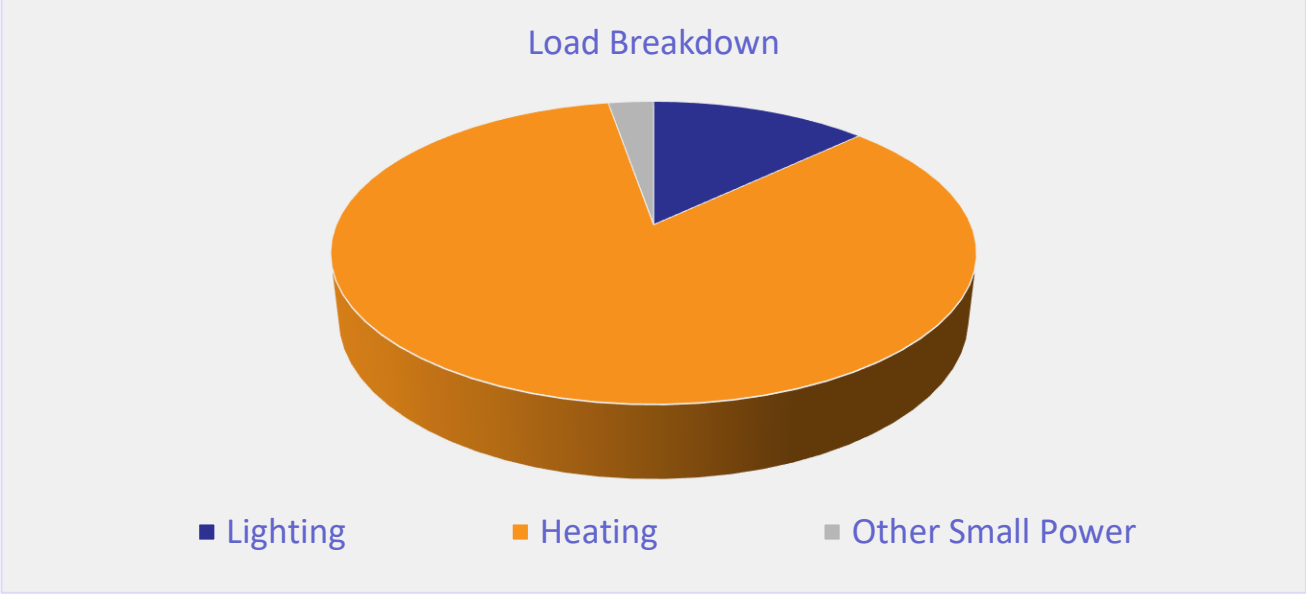
The above tables also details the separate meters serving the hall as these are invoiced by the same company (Opus) as the church and the information above should allow the church to sperate out which invoices are for which building.

All the meters are AMR connected and as such energy profile for the entire energy usage should be possible. It would appear to be a faulty AMR unit on the church gas supply which is resulting in zero consumption being billed. It is recommended that this is fixed and also that access is obtained into the half hour usage data so that clear usage profiles of the energy can be seen.

4.1 Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	Mainly spot and halogen candles throughout the church.	13%
Heating	Gas fired boiler serving radiators and under floor heater beneath grilles	84%
Other Small Power	Small l-plug in appliances, organ etc.	3%



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 All Saints, Ascot Heath uses 66.8% more electricity and 19.3% more heating energy than would be expected for a church of this size.

	Size (m^2 GIA)	All Saints, Ascot Heath use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
All Saints, Ascot Heath (elec)	312	33.36	20	10	66.8%
All Saints, Ascot Heath (gas)	312	178.99	150	80	19.3%
TOTAL	312	212.35	170	100	24.9%

The increased electrical consumption will be due to the relatively inefficient lighting especially the external floodlights and the timings on these.

The increased heating consumption over the benchmark is mainly due to the fact that the church is maintained with a background heating level of 15°C which will result in gas use during unoccupied times.

5. Energy Saving Recommendations

5.1 Lighting (fittings)

The internal lighting makes up a relatively large overall energy load within the building, and large areas are lit by relatively inefficient spot and halogen candle lights. The external lighting comprises of a number of inefficient flood lights

It is recommended that the fittings scheduled in Appendix 1 are all changed for LED units. In the case of the external flood lights this should be a replacement fitting for a new LED flood light. In the case of the candle bulbs which are currently 28W halogen lamps, these could be replaced for 5.5W LED bulbs which are widely available (i.e. https://www.johnlewis.com/philips-5-5w-bc-candle-led-light-bulb-frosted-pack-of-6/p2721473) and which have a 470 lumen output which is brighter than the current 370 lumen output.

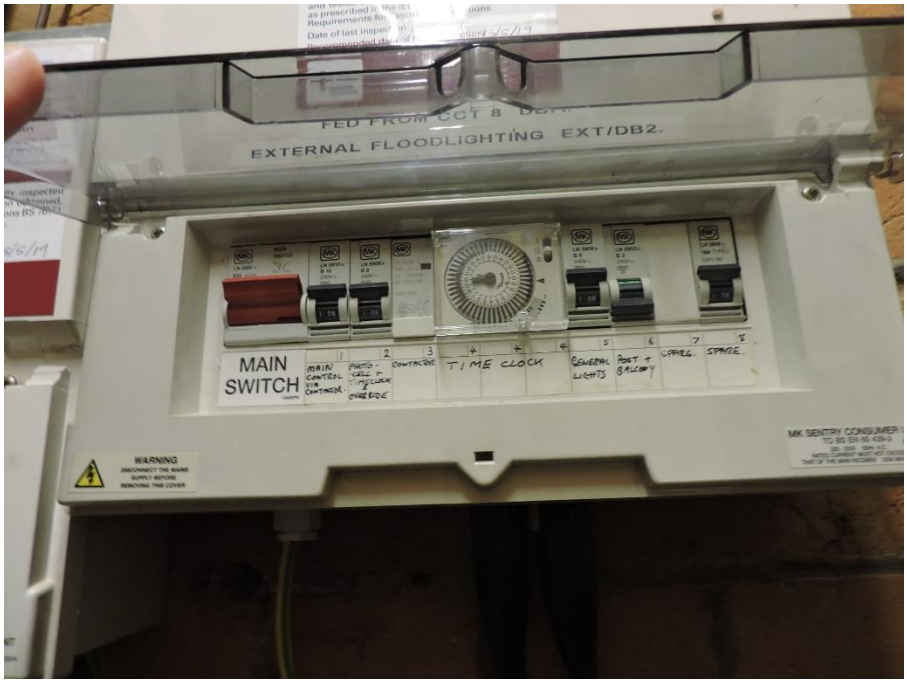
For the spot lights the Megaman range of LED spot (reflector) lights https://www.megamanuk.com/products/led-lamps/reflector/ provides some very suitable substitutes to the current bulbs and in particular the three spots which illuminate the cross above the door and which are permanently left on should be replaced for LED in the short term.

If all the lights were changed the total capital cost (supplied and fitted) would be £2,607. The annual cost saving would be £859 resulting in a payback of around 3.03 years. 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 LED bulbs which the church installs themselves.

5.2 Lighting (control for external lights)

The external lighting is currently on until midnight. For efficient operation and to reduce light pollution and nuisance to neighbours it is generally recommended that external lighting is turned off between 10pm and 6am unless required for specific purposes.

It is therefore recommended that the existing timer is adjusted to switch off the external lights at 10pm daily. This adjustment can be easily made by a competent person on site.



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.

Endotherm can be purchased (through the above link) and self-installed. The church may wish to consider undertaking a full clean of the existing system by a professional mechanical services contractor and refilling with both inhibitor and Endotherm on completion.

5.4 Space Temperature Set Point

The current background temperature set point is 15°C. The relative merits of having background heating at all can be debated but given that the church has wall paintings and regular visitors which the PCC wishes to provide a warm welcome to, some level of background heating can be justified.

It is recommended that serious consideration is given to what temperature this background level should be. A level between 10°C and 12°C should be very adequate for the building and the paintings which are more impacted by changing temperatures and high humidity (which is generally lower when the temperature are lower). We would therefore suggest that the church considers lowering the background heating level to 12°C in lieu of 15°C and would encourage them to trial this for a period.

5.5 Quattro Seal to Doors

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 in to 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

5.6 Move to Electric Panel Heaters in Lady Chapel

The heating within the Lady Chapel is currently three cast iron column radiators which are run of the main heating circuit. Therefore, when this area is used for the mid-week services, the whole of the church has to be heated. To avoid having to heat up the entire church building for these smaller mid-week services it is recommended that the PCC consider installing three electrical panel heaters in this area on a time delay switch and remove the existing radiators.

Suitable electric panel heaters would be far infrared panels such as https://www.warm4less.com/product/63/1200-watt-platinum-white- . 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 accidently after use.

5.7 Insulate around Underfloor Heaters in Chancel

Within the chancel the heating is provided from heater units, served from the boiler, located underneath the floor grilles. There are trenches that run out of this area in which the pipes run to other heaters. The ground around the heater and also the underground trench represent areas where useful heat is lost. It is recommended that sheet insulation is fitted around the sides of the trench including to block up the side with the trench so that the heater sits in an insulated box and all the heat comes out the top into the church.

Such work could be carried out by any competent person using insulated board such as Marmox Multi Board that could then be finished in a black paint.

6. Other Recommendations

6.1 Electric Vehicle Charging Points

The church has a car park to the side and rear of it which serves the church and also the frequently used church hall. 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, probably on the side of the church hall to allow visitors to charge their electric car.

Installing a unit such as a Rolec Securi-Charge http://www.rolecserv.com/ev-charging/news/view/Robust-EV-Charging-With-Rolecs-SecuriCharge-EV-Wall-Unit-Coin-Token-PAYG would allow the church to be able to sell tokens or have a coin operated device that would at least cover the costs of the electricity use and could make a small income. As the hall is a place of work for the pre-school users it may be able to benefit from a grant to part cover the installation costs of a charger from https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers

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 roof
Battery Storage	No – no PV generation
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – visible roof
Ground Source Heat Pump	No – archaeology in ground
Air Source Heat Pump	No – not financially viable in church given current systems, could be viable in hall when boiler needs replacing
Biomass	No – on mains gas

Given the visibility of the roofs and other attributes of the site it is not considered viable for any renewable systems to be considered at this time and instead focus should be given to reducing the overall energy demands within the church. Should the church wish to make a more visible public statements about its stewardship then this can be achieved with the installation of an electric vehicle charging point.

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
Nave (BC, 28W halo candle, 370lm)	28	LED GLS	£109.69	£294.00	2.68
Nave	13	R63 LED	£60.99	£279.37	4.58
Spots to cross at rear of nave	3	R50 LED	£19.54	£35.67	1.83
Wall washers at base of nave trusses	6	LED GLS	£55.21	£63.00	1.14
Track spots to paintings in side aisles	6	R50 LED	£39.08	£71.34	1.83
Lady chapel	6	R63 LED	£28.15	£128.94	4.58
Chancel	16	R63 LED	£75.07	£343.84	4.58
Track spots to chancel and altar	12	R50 LED	£78.17	£142.68	1.83
Vestry	3	NO CHANGE	£109.69	£294.00	2.68
External	3	30W LED Flood	£48.98	£273.90	5.59
External	6	100W LED Flood	£363.50	£732.00	2.01