Energy Audit and Survey Report

St Andrew's Church, Priestwood

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	7th May 2019	1.0

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1. Executive Summary

An energy survey of St Andrew's Church, Priestwood 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 Andrew's Church, Priestwood is modern church building constructed 30 years ago as part of the housing development in the area but struggles to effectively provide a comfortable heating level. 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 4 x direct gas heaters to church. Remove similar heaters to vestry areas and install radiators	N/A – benefit is improved comfort	N/A	£15,000	N/A	Faculty	
Fit 270mm of insulation into the loft	5,600	£194	£500	2.57	List A/B	
Insulate exposed pipework and fittings in plantrooms	2,830	£98	£500	5.10	List A	
Upgrade windows and doors to double glazed units	11,200	£388	£35,000	90.11	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?
Install thermostatic radiator valves (TRVs) on porch radiator.	3,360	£117	£660	5.66	List B	
Change existing lighting for low energy lamps/fittings	2,431	£384	£4,161	10.84	List B	
Install PIR motion sensors on porch lighting circuit	21	£3	£40	11.80	List B	

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

Based on current prices of 15.79p/kWh and 3.47p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,184 per year.

2. Introduction

This report is provided to the PCC of St Andrew's Church, Priestwood 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 Andrew's Church, Priestwood is a 30-year-old building. It was constructed as part of the housing development in the area in the early 1990's. It is therefore of a relatively modern construction with insulated cavity walls and pitched roof but has signs that it was built to a budget with poor quality windows, many of which have failed. The heating system is reported to be poor and unable to successfully heat the congregation.

An energy survey of the St Andrew's Church, Priestwood, Bracknell, RG42 1TU was completed on the 23rd April 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 Andrew's Church, Priestwood	
Gross Internal Floor Area	350 m^2 (approx)
Listed Status	Unlisted

The church typically used for 19 hours per week for the following activities

Services	3 hours per week
Meetings and Church Groups	6 hours per week
Community Use	10 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 electricity have been supplied by St Andrew's Church, Priestwood and have been reviewed against the current market rates for energy.

The gas bills were not copied and therefore the consumption and rates have been estimated.

The current electricity rates are:

Day Rate	16.91p/kWh	Above current market rates
Evening and Weekend Rate	14.93p/kWh	Above current market rates
Standing Charge	Nil	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 when its current contract ends in November 2020. 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 Andrew's Church, Priestwood uses 4,736 kWh/year of electricity, costing in the region of £750 per year, and an estimated 56,000 kWh/year of gas, costing an estimated £2,000 per year.

The electricity data has been taken from the annual energy invoices provided by the suppliers of the site for electricity and estimated for gas. St Andrew's Church, Priestwood has one main electricity meter, serial number E12Z030771. There is one gas meter serving the site, serial number G4K03367010101.

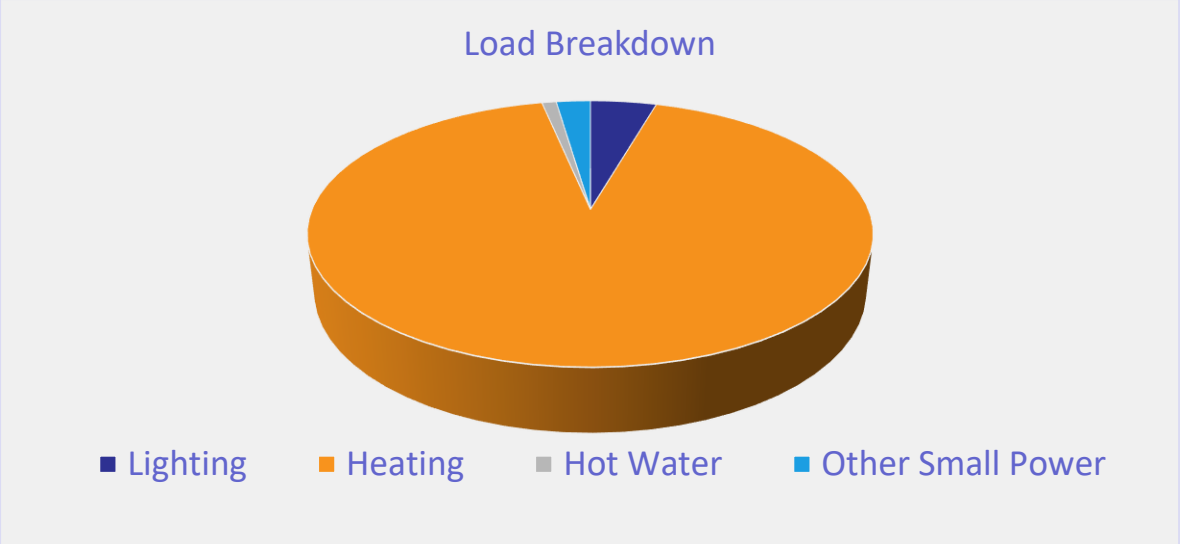
Utility	Meter Serial	Type	Pulsed output	Location
Electricity	E12Z030771	1 phase 100A	Y	Meter box on external side wall
Gas	G4K03367010101	BK-G4	N but capable	Meter box on external side wall

All the meters are AMR capable but have not been connected. 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	Predominantly inefficient T8 fluorescent lighting with some 2D fittings and inefficient high-level SON lighting to the nave.	4%
Heating	A gas condensing boiler serving high level radiant ceiling panels within the church and some standard panel radiators to side rooms. Direct fired gas heaters to the two vestries.	92%
Hot Water	Electric point of use hot water heater with a small level of storage.	1%
Other Small Power	Power used in AV equipment, kitchen appliances and the like.	2%



As can been seen from this data, the heating is estimated to make 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 Andrew's Church, Priestwood uses 32.3% less electricity and 6.7% more heating energy than would be expected for a church of this size.

	Size (m^2 GIA)	St Andrew's Church, Priestwood use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Andrew's Church, Priestwood (elec)	350	13.53	20	10	-32.3%
St Andrew's Church, Priestwood (heating fuel)	350	160.00	150	80	6.7%
TOTAL	350	173.53	170	90	2.1%

5. Energy Saving Recommendations

5.1 Lighting (fittings)

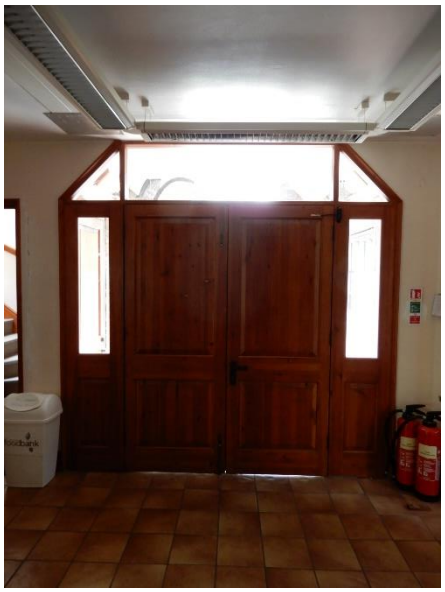
The lighting makes up a relatively small overall energy load within the building, but all areas are lit by inefficient fittings. To the main church/nave area there are three high level flood light units and to lower levels and the side rooms there are T8 fluorescent lighting and some 2D lighting.

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 £4,161. The annual cost saving would be £384 resulting in a payback of around 11 years.

5.2 Lighting (control for internal lights)

The lighting in the porch tends to remain on all the time the building is occupied. This area is only used occasionally and for a short amount of time and as such, the light does not need to remain on constantly.



It is recommended that a motion sensor is installed on this lighting circuit so that the lights come on only when movement is detected in the space and turn off approximately two 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 Insulation of Pipework and Fittings

The pipework within the boiler room has not had insulated fitted to it. These exposed areas of pipework contribute significantly to wasted heat loss from the system and make the plant room unnecessarily warm. The exposed hot surfaces also represent a health and safety risk of burns for those working in the area.

It is recommended that these areas of exposed pipework and fittings are insulated. For the more complex fittings bespoke jackets can be made, these wrap around the various elements but can be removed and then replaced for any servicing activities.

A free survey and quotation for the supply and installation of insulation of pipework fittings can be arranged through Anthesis Ltd (contact Margaret Davis, 0117 403 2689, Margaret.Davis@anthesisgroup.com) or ESOS Energy Ltd (contact Adrian Newton 0117 9309689, adrian@esos-energy.com).

5.4 Thermostatic Radiator Valves (TRVs)

The building is partly heated by radiators and not all of these have thermostatic radiator valves (TRVs) installed on them.

TRV's can be installed on the existing radiator in the porch and allow the users of the room to have some element of control over the temperature in the room and prevent over-heating which often leads to situations where the heating is on and the windows are open. It also allows un-used spaces to have the heating in them turned down.

It is recommended that TRVs are installed on all radiators and users advised as to the best way to operate these once they have been installed. TRV's can be supplied and installed by any good heating engineer.

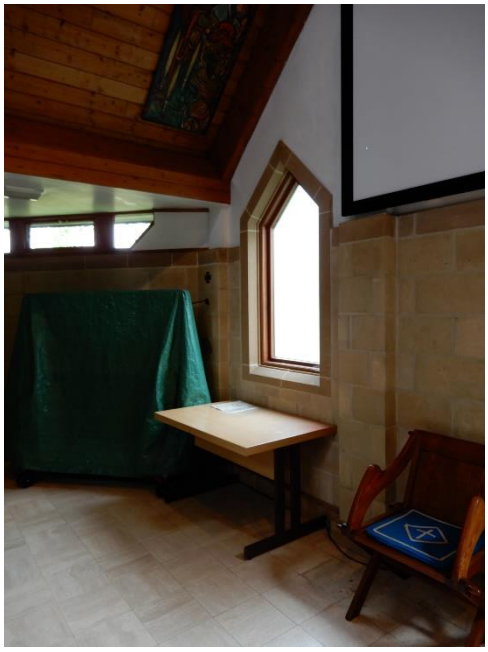
5.5 Upgrade of Heating System

The existing heating system fails to provide adequate warmth into the church. The current operational strategy is for the heating to be turned on around 18 hours prior to a service and even then, the amount of heat that has built up within the building is barely acceptable.

The issue appears to be that there is simply insufficient heat output from the relatively small radiant panel heaters in the main body of the church and that their positioning is such that the useful heat rises. There is then high levels of heat loss from the building, predominantly from the poor standard of windows, so that the heat input from the radiant panels is insufficient to overcome the heat loss from the building.

To create a comfortable environment a dual approach of reducing the heat loss (see below recommendations for window replacement and loft insulation) and increasing the heat output need to be considered.

Strangely, there is the opposite issue within the two vestry areas. These small rooms have direct fired gas heaters which are flued through the wall. These have a high heat output which is too much for the space and leads to overheating in these two rooms.



In order to improve the heating system, it is recommended that the radiant panels within the church space are made redundant (they could be removed from the timber panelled roof although it would be more difficult to remove the panels from the lower levels but they could be retained) and four direct gas fired heaters fitted. There is a suitable wall space under each of the four-small windows (where desk is currently situation in photo). Each heater would need a gas supply running to it which could be run externally around the perimeter of the building as well as an electrical supply for the fan. A suitable heater product would be something similar to http://www.vulcanagas.co.uk/products/powered-flue-fan-assisted-heaters/kestrel-55/ . Each of these heaters has an output of 16.2kW so four of them would have a combined 64.8kW output which should be more than sufficient to quickly heat up the church even on a cold winters day. (for comparison the existing boiler has a total 38kW output for the whole

building, but this is limited within the church by the number of radiant panels which are probably around 20kW output in total)

There is a concern that the current incoming gas supply may not be able to support 4 of these heaters and the existing gas boiler. It may be possible for the gas meter itself to be increased in size without the need to increase the supply pipework to it in order to increase the supply capacity and Transco should be contacted to advise on the feasibility of this.

In the short term it would be possible to remove the two heaters from the vestry and to use their gas supply capacity to serve two heaters within the main church area. This could be easily done to the rear of the church where the gas pipe already runs. The one heater within the priests vestry could be capable of being relocated, although the one to the choir vestry should be considered as being at the end of its serviceable life. The relocation of this heater from the priest vestry to the church could be something that could be undertaken in the short term under a list B application so that the overall approach is trialled without incurring huge initial expense.

In the medium term the heating to the vestry's should be replaced with standard panel radiators with TRV's on them, as are used elsewhere within the church. These can be connected to the existing boiler and as the heating requirements of the boiler will be reduced by removing the radiant panels from the ceiling of the church off the system there will be more than enough boiler capacity to serve these additional radiators. Another option to these spaces would be to fit electric far I-R panel heaters to them such as https://www.warm4less.com/product/63/1200-watt-platinum-white- . This could be quicker, easier and cheaper to install than the panel radiators and very suitable if the space is only be used for a short period of time. These can be purchased widely and fitted by any competent electrician.

5.6 Roof Insulation

The loft space above the All Starz hall was inspected and found to have 50mm of insulation within it. Over time this has been disturbed and there are sections which now have little or no insulation to it. It is therefore recommended that the insulation within this space is topped up with an additional 200mm of insulation laid across the joists in the opposite direction. This could be an action which competent members of the church could install themselves and the materials could be funded from the small grant available through this audit process.

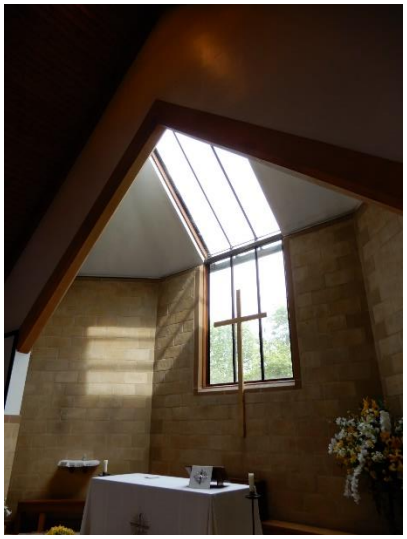
5.7 Wall and Floor Insulation

The plans for the original construction were reviewed and it was noted that there is insulation included into the cavity walls and also to the pitched roof above the main church area. There is no insulation to the floor construction. These areas would be difficult to add more insulation to and it is suggested that this need not be a priority.

5.8 Replacement Windows and Doors

It is the windows (and doors to a lesser extent) to this church building which are undoubtably the major cause of the high heat loss out of the space. The window with the highest heat loss is the feature window behind the altar. All the windows are a poor-quality timber construction where the seals have failed, and the thin double-glazed panes have also failed in many areas. The window behind the altar has a complex joint between a vertical and a pitched section and the church report that there are large air gaps around this joint where debris from the trees outside is noted to blow in and dirty the altar cloths. This strongly suggests that as well as small bits of leaves and pollen, a very large amount of cold air is blowing in to the building too.

It is therefore recommended that the church replace the windows (and the doors) within the building to modern, well-sealed, double glazed units. Given the modern nature of the church it could be acceptable for these to be in a high-quality uPVC construction with a timber style foil finish to them. The priority should be on the window behind the altar which would need to be redesigned so that there was a solid joint between the vertical and pitched sections so that a proper air tight seal can be created.



6. 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 – small visible array on south facing roof
Battery Storage	Yes – in conjunction with PV above
Wind	No – lack of suitable location
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water demand
Ground Source Heat Pump	No – insufficient ground area and wrong type of heating installed and required.
Air Source Heat Pump	Yes – possible for air to air
Biomass	No – issues with delivery and fuel storage, no advantage over mains gas

There is potential for a small PV array on the top of the south east facing slope of the roof. This would be highly visible but given this is a modern building this would be acceptable.

As the feed in tariffs have now come to an end the financial viability of any PV array requires almost all of the electricity to be used on site, ideally as it is generated. The electrical usage of the church is small and therefore only a small number of panels would be needed and viable. Coupled with a small battery storage system it could be possible for the church to be large self-sufficient in terms of electrical need.

While such installations can be considered as feasible, they are not high priority and could be considered more as a ‘nice to have’ item which should only be considered if it is coupled with using it to demonstrate the churches stewardship mission.


Saltire Gardens
St Andrew's Church
Priestwood Ct Rd
The New Priestwood
Community Association
The Willows an
Children's Cent

7. 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.

8. 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
Porch	4	4ft Single LED	£17.97	£288.40	16.05
WC area	3	2D LED 11W	£11.89	£163.65	13.77
Kitchen	2	5ft Single LED	£40.81	£187.40	4.59
Under balcony	6	2D LED 11W	£23.78	£327.30	13.77
Nave	4	High Bay UFO 100w	£118.56	£1,256.00	10.59
Side chapel	10	4ft Single LED	£44.93	£721.00	16.05
Vestries	5	4ft Single LED	£58.97	£360.50	6.11
All Starz hall	5	4ft Single LED	£58.97	£360.50	6.11
Stairs	2	2D LED 11W	£7.93	£109.10	13.77