Energy Efficiency and Zero Carbon Advice

St Barnabas, Peasemore

PCC of St Barnabas

Author	Reviewer	Date	Version
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Contents

1. Executive Summary

An energy survey of St Barnabas 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 Barnabas dates back to the 1840s, with the chancel built in the 1860s. It is constructed from grey brick, stone spire and a plain tiled roof. The heating is via overhead heaters, and there are some redundant pew heaters in situ still. There is electricity supplied to the site.

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.

Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Payback (years)	Permission needed	CO2 saving (tonnes of CO2e/year)
Contact suppliers to arrange for the meters to be changed to smart meters	None	None	Nil	N/A	None	N/A
Switch electricity (and gas) suppliers to ones which provide 100% renewable (or green gas) supplies	None	None	Nil	N/A	None	Offset 1.64 tonnes
Change existing lighting for low energy lamps/fittings	16	£2	£10,580	6131.90	Faculty	0.00
Improve heating system for electrical based heating solution	N/A	N/A	£27,333	N/A	Faculty	0.35

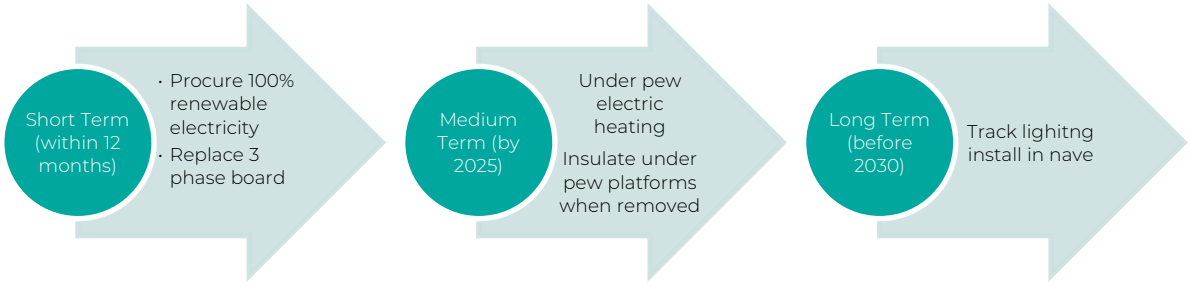
The church should check any faculty requirements with the DAC Secretary at the Diocese before commencing any works.

Based on current contracted prices of 10.84p/kWh for electricity.

2. The Route to Net Zero Carbon

The Diocese of Oxford's Diocesan Synod has set a target of reaching Net Zero Carbon by 2035, or as soon thereafter as is possible. General Synod, meanwhile, has set a target for the Church of England to reach a limited-scope Net Zero Carbon target by 2030. Our diocese will need to respond to the national target. which, as it is presently framed, means that every church, cathedral, church school and vicarage in the C of E will need to reach net zero - or compensate for residual emissions - within the next ten years..

This church has a clear route to become net zero by 2035 by undertaking the following steps:



3. Introduction

This report is provided to the PCC of St Barnabas to give them 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 Barnabas, Prince's Lane, Peasemore, Newbury RG20 7JQ was completed on the 23rd October 2020 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 Barnabas	
Church Code	627428
Gross Internal Floor Area	194 m^2
Listed Status	Grade II

The church typically used for 2 hours per week for the following activities

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Services	2 hours per week	
Meetings and Church Groups	0 hours per week	
Community Use	0 hour per week	

There is additional usage over and above these times for festivals, weddings, funerals, and the like.

4. Energy Usage Details

St Barnabas uses 6,490 kWh/year of electricity, costing in the region of £700 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Barnabas has four main electricity meters.

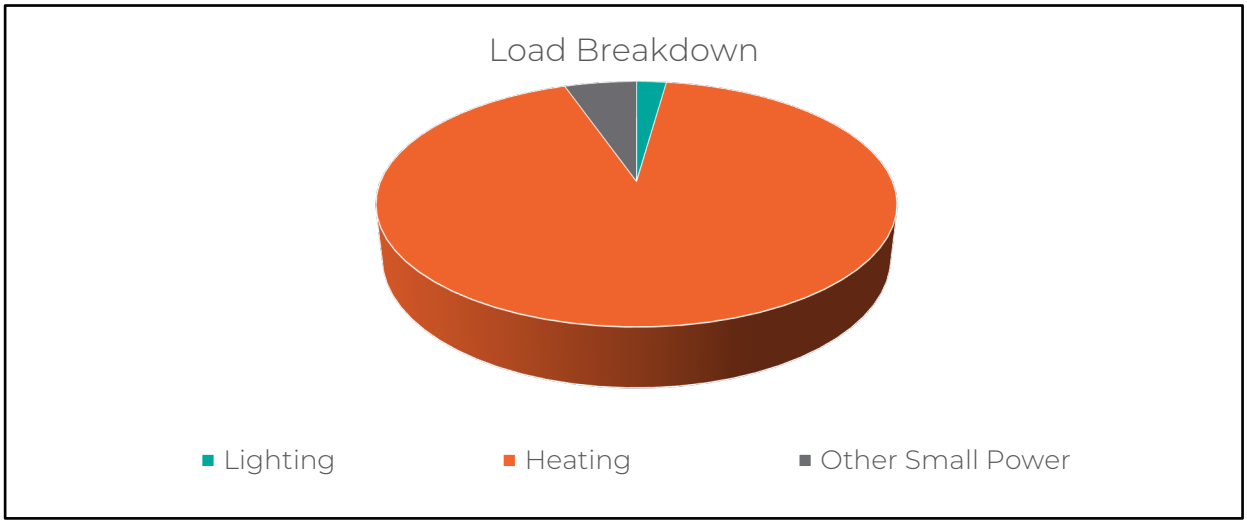
Utility	Meter Serial	Type	Pulsed output	Location
Electricity	S07R00224	ACE1000	No Pulse or AMR	Rear of nave
	S06R43902	ACE1000	No Pulse or AMR	Rear of nave
	S07R21108	ACE1000	No Pulse or AMR	Rear of nave
	F30C12469	Dial Meter	No Pulse or AMR	Rear of nave

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	A mixture of PAR 38 spots and some LED units	2%
Heating	Overhead heaters with some redundant tube heaters	92%
Other Small Power	Dehumidifier, plug in electrical heaters	5%



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 Barnabas uses 80% less energy for its electricity and heating than would be expected for a church of this size.

	Size (m^2 GIA)	St Barnabas use kWh	St Barnabas use kWh/m^2	Typical Church use kWh/m^2	Variance from Typical
TOTAL	194	6,490	33.41	170.00	-80%

5. Efficient / Low Carbon Heating Strategy

The energy used for heating a church typically makes up around 80% to 90% of the overall energy consumption. Heating also often uses gas or oil as its primary fuel, these are fossil fuels with high carbon emissions and little opportunity to decarbonise in the future. Electricity currently has carbon emissions around the same level as mains gas but the carbon emissions associated with electricity are reducing rapidly as the UK builds more renewable energy and decommissions it remaining oil and coal fired power stations. Mains gas does have some potential to reduce its carbon content through the use of bio gas and hydrogen but these are less developed solutions and will be unable to deliver 'zero carbon mains gas'. It is therefore a critical element to review and set out a plan to make more efficient and less carbon intensive and one way to achieve this is to consider a transition to electrical heating where this also represents a more efficient and comfortable solution for churches..

The church is already served by all electric heating and it has no other energy source. The church is only used for Sunday worship and therefore electric heating is by far the most efficient method of heating. The advice below is therefore focused around how to improve and update the electric heating to provide vastly improved comfort levels.

The current heating to the church is some redundant under pew tube heaters which have been largely disconnection due to electrical issues, some over head infra-red heaters and some high level window cill tube heaters.

It is recommended that the under pew tube heaters are removed and replaced with under pew panel heaters which will be significantly more effective and provide good levels of comfort to the congregation. The high level tube heaters can remain to reduce the cold down draughts that will come from the windows. The overhead units will be able to be removed which will then facilitate an improved lighting solution for the church.

5.1 Install Electric Under Pew Heaters

For replacement, two most popular under pew heaters within churches are BN Thermic PH65 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating.

We would therefore suggest that the following works could be considered:

Install Under Pew Heaters suspended from brackets from the underside of the pew seat as follows:

Nave, 19 pews with three PH45 heaters in each row between uprights

Choir, twelve PH45 heaters between uprights.

Cable runs to the pew heaters should run along the along the existing routes (all cabling should be in armoured cable or FP200 Gold when above ground) to both rows of pews. Each pew heater to be switched with a neon indicated fused spur located underneath the pew seat.

The three/four high level radiant heaters within the nave/by the organ should be removed completed with all associated cabling back to the distribution boards.

The under pew (see photo below) and panel heaters have been recently installed at St Andrews Church, Chedworth, Gloucestershire, GL54 4AJ. The church is open in daylight hours so can be viewed at any time.

5.2 Install Electric Panel Heaters

It is planned for the rear of the nave to have some of its pews removed. This will prohibit the use of under pews heaters so instead it is recommended that the PCC consider installing electrical panel heaters in this area on a time delay switch.

Suitable electric panel heaters would be far infrared panels such as which are widely available. These can be purchased easily on-line and fitted by any competent electrician. It is recommended that they are fitted with a time delay switch so they cannot be left on accidently after use.

These heaters have a strong radiative effect (where heat is reflected to people from the surface) as well as a light convective effect (where air is warmed and moves around to heat the general space). As such these heaters tend to provide a relative instant sense of heat and comfort within the space and only need to be on for short periods of time

5.3 Tidy up 3 Phase Electricity Supply

To be able to have sufficient electrical power to supply enough energy into an electrical heating system the church needs a 3 phase 100A supply which the church currently has but the arrangement is somewhat complex!

Rather than having one three phase meter the church has 4 single phase meters (with two of the meters coming off as a split phase arrangement). Not only does this lead to a messy and complex arrangement of meters but also leads to the church being charged for 4 lots to service charges.

It is recommended that the church contacts its supplier and investigates the removal of the 4 existing meters and the installation of one new 3 phase meter. The aged electrical distribution boards would then benefit from being upgraded and tidied up into one three phase distribution board into which the new lighting and heating could be wired into.

5.4 Reordering of rear area

The church indicated that it is considering the reordering of the rear of the nave which will include the removal of pews in this area and the lowering of the pew platforms to provide a level floor. When these pew platforms are lowered this must be used as an opportunity to introduce insulation in between the floor joists to reduce the heat loss and prevent cold draughts coming up from the floor. If access is made underneath the retained pew platforms for wiring the new heaters then insulation should be considered under these areas also.

6. New LED Lighting

The existing church lighting is rather inadequate and consists of some high wattage PAR 38 lamps in the aged, combined heating and lighting pendant fittings as well as some wall mounted brackets with CFL lights in them. Both these fittings have a strong visual impact on the interior of the church. It is recommended that an improved lighting scheme would consists of an LED track light mounted vertically down the side of the bases to the trusses. On these tracks could be clipped two, three of four LED spots (often seen in retail uses) that could be directed to give general light, highlights to areas such as the pulpit or lectern and also to give some up-lighting to the roof. While this is not strictly an energy saving measure (due to the far too low existing lighting output) using LED spots will create a more suitable lighting arrangement for this church using the minimum possible energy.

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 – not sufficient demand, visible roof
Wind	No – no suitable land away from buildings
Battery Storage	No – no viable PV
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Biomass	No – not enough heating load as well as air quality issues
Air Source Heat Pump	No – insufficient electricity supply
Ground Source Heat Pump	No – archaeology in ground and radiator system

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 .

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.

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