ESOS-ENERGY
Energy efficient solutions

Energy Audit and Survey Report

St Paul's Church

PCC of St Paul's, Paignton

Version Control

Author	Reviewer	Date	Version
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1. Executive Summary

An energy survey of St Paul's Church was undertaken by ESOS Energy 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. This audit has been provided in conjunction with 2buy2, the Church of England's Parish Buying scheme provider and is subsidised from Total Gas & Power, the Parish Buying schemes principal energy suppliers.

St Paul's Church is a large, red brick church located in Preston, Paignton and built in the late 1930s. A link building was latterly introduced to link the church to the hall (not surveyed). The church is predominantly lit by fluorescent fittings and a condensing gas boiler provides heating to perimeter radiators. There is both gas and 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 (£)	Simple Payback (years)	Permission needed	CO2 saving (tonnes of CO2e/year)	£/tonne of CO2
Contact suppliers to arrange for the meters to be changed to smart meters	None	None	Nil	N/A	None	N/A	N/A
Switch electricity (and gas) suppliers to ones which provide 100% renewable (or green gas) supplies	None	None	Nil	N/A	None	N/A	N/A
Change existing lighting for low energy lamps/fittings	1,434	£164	£6,702	40.9	List B / Faculty	0.44	£15,218

Discontinue background heating	Unknown as no energy data or energy bills provided	Nil	Immediate	None	N/A	N/A
Consider electric heating in the long term (when boiler fails)		£10,000	N/A	Faculty	N/A	N/A
Fit 270mm of insulation into the loft		£4,000	N/A	List A / List B	N/A	N/A
Install Endotherm advanced heating fluid into heating system(s)		£640	N/A	None	N/A	N/A
Consider installing Electric Vehicle charging points		£2,500	N/A	Faculty	N/A	N/A

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

2. Introduction

This report is provided to the PCC of St Paul's Church 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 Paul's Church, Locarno Avenue, Paignton, Devon TQ3 2DH was completed on the 4th December 2019 by David Legge. David is an experienced energy auditor with over 10 years' experience in sustainability and energy matters in the built environment. David is a fully qualified ESOS lead assessor with CIBSE, a CIBSE Low Carbon Consultant and a fully qualified ISO50001 lead auditor.

St Paul's Church	**615279**
Gross Internal Floor Area	650 m^2
Listed Status	Unlisted
Typical Congregation Size	40

The church typically used for 6 hours per week for the following activities

Services	6 hours per week
Meetings and Church Groups	Ad hoc use only
Community Use	Ad hoc use only

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

3. Energy Usage Details

No energy bills or consumption data has been provided to support this report.

In comparison to national benchmarks[1] for Church energy use, St Paul's Church would be expected to use 13,000 kWh of electricity and 97,500 kWh of gas per year. When the PCC have actual energy data, they should compare their usage against this benchmark.

	Size (m^2 GIA)	St Paul's Church Expected usage kWh	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2
St Paul's Church (elec)	650	13,000	20	10
St Paul's Church (heating fuel)	650	97,500	150	80
TOTAL	650	110,500	170	90

[1] CofE Shrinking the Footprint – Energy

4. Energy Saving Recommendations (Electricity)

4.1 Lighting (fittings)

Most areas within the church are lit by inefficient fluorescent tube fittings. The ceiling uplighters in the nave are T8 fluorescent tube fittings, similar to the fittings in the foyer and choir vestry. These fittings are widely available on the market and it is suggested that the complete fitting (not just the lamp) is replaced. Any new LED fitting would have a much longer life and hence reduce the need to replace the lamps in the ceiling.

It is recommended that all of the fittings, scheduled in Appendix 1, are changed for LED. This could be undertaken in a direct like of like basis which is what has been costed in this report, but the church may wish to consider using the opportunity to improve the lighting and consider a track lighting solution, fixed to the wall plate, which would provide greater flexibility and ability to create lighting effects. Track fittings such as https://www.sylvania-lighting.com/product/en-GB/products/2059568/ are regularly used to light churches such as this.

If all the lights were changed on a like for like basis, the total capital cost (supplied and fitted) would be £6,702. The annual cost saving based on 6 hours per week usage would be £164 resulting in a payback of around 40 years. Many of the lights could be self-installed and therefore cost much less than the supply and fit cost above.

5. Energy Saving Recommendation (Heating)

5.1 Heating System and Strategy

The church currently uses a condensing gas fired boiler to heat the church via perimeter convector heaters. This is reported to work well and provides adequate thermal comfort into the church. Given that the system is successful and not overly wasteful of energy we would recommend that this system is continued with and consideration is given to the following improvements when the boiler reaches the end of its serviceable life.

As congregation sizes are typically around 40 people, as the boiler starts to fail, consideration should be given to under pew heating to provide heating to the first five rows of pews and avoid the

necessity to heat the entire church. The two most popular under pew heaters within churches are BN Thermic PH30 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating. Cable runs to the pew heaters could run along the North and South walls (all cabling should be in armoured cable or FP200 Gold when above ground) to the rows of pews quite easily.

Given the current rates for gas and electricity, the use of electric under pew heaters may not deliver a cost saving, but it would improve comfort levels to the occupants and cut the churches carbon emissions significantly – in future, as energy prices change the costs are likely to improve and the carbon emissions savings will become even greater.

5.2 Reduce / Discontinue Background Heating

The central heating system is not needed to preserve the fabric but only to provide thermal comfort to occupants. The previous trend of 'conservation heating' for fabric issues is now largely considered to be unnecessary and is being avoided by the likes of National Trust and English Heritage. The only times when background heating may be required is if there are historic wall paintings or to for the preservation of large artefacts such as tapestries. The organ may require some local background heating specific to that area. Organs can be installed with a local background tube heater such as https://www.dimplex.co.uk/product/ecot-4ft-tubular-heater-thermostat within the organ casing in order to provide the heat where it is required. The fabric is often subject to the greatest damage by humidity (which is naturally higher when the air is warmer as warmer air has greater capacity for holding more moisture), as a result of large temperature swings (from central heating systems turning on and off) and from the excessive drying out/baking of timbers where high temperature heating units have been fixed to them (such as overhead heaters fixed to timber wall plates)

Providing constant background heating to the church building as a whole at a level of 13°C is excessive and wasteful of energy. At the very least we would recommend that this background level is reduced to a maximum of 10°C and ideally avoided all together.

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 is 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 supplied and self-installed.

6. Energy Saving Measures (Building Fabric)

6.1 Roof Insulation

The loft void above the ceiling was not inspected as part of this audit but is understood to have little insulation present. In all cases where there is 100mm or less of insulation within accessible roof spaces, it is recommended that insulation be added to prevent heat loss and create a more comfortable environment for the occupants of the building.

The ceiling/roof of a building is the largest contributing area to heat loss from a building as heat rises. The insulation of such spaces can therefore have a dramatic impact on both the efficiency of the heating system and the temperature of the space below. Insulation measures such as this also need to be combined with control measures such as TRV's or room sensors to ensure that the space does not overheat because of the additional insulation.

7. Other Recommendations

7.1 Electric Vehicle Charging Points

The church has a car park to the front 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.

8. 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
Battery Storage	No – no viable PV
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Ground Source Heat Pump	No – unless car park is excavated at any stage
Air Source Heat Pump	No – insufficient electricity demand
Biomass	No – not enough heating load as well as air quality issues

Now that the Feed in Tariff scheme has come to an end the installation of solar PV panels in situations where there is not almost full usage of the electricity generated on site is not really viable.

Having reviewed the site it is not considered that there is good viability for any renewables and instead a good clear focus on reducing the energy demand of the building should continue with a targeted approach on reducing the heating energy.

9. Funding Sources

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-Nov-2019.pdf

10. 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.

11. Report Circulation

In addition to the PCC, this report is also sent to:

1. Your DAC secretary and your DEO, because
    - They maybe be able to offer you help and support with implementing your audit
    - They want to look across all the audits in your diocese to learn what the most common recommendations are.

    Catherine Ross, the officer in the Cathedral and Church Buildings team centrally who leads on the environment, who wants to learn from all the audits across the country. She will be identifying cost-effective actions churches like yours might be able to make.

Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

Room/Location	Number of Fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
Vestry	2	5ft Single LED	£3.95	£187.40	47.47
Church	36	LED GLS	£52.95	£756.00	14.28
Side Chapel	1	LED GLS	£5.88	£84.00	14.28
Church uplighters	46	5ft Single LED	£90.80	£4,310.20	47.47
Foyer	3	5ft Single LED	£2.86	£281.10	98.13
Foyer	5	2D LED 11W	£3.32	£272.75	82.13
Choir vestry	2	5ft Single LED	£3.95	£187.40	47.47