ESOS-ENERGY
Energy efficient solutions

Energy Audit and Survey Report

St Eustachius Parish Centre

PCC of St Eustachius

Version Control

Author	Reviewer	Date	Version
David Legge	Matt Fulford	10th February 2020	1.1

Contents

1. Executive Summary

An energy survey of St Eustachius Parish Centre 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 Eustachius Parish Centre is located in the heart of Tavistock, South Devon and was built in 1985. The building comprises of a main activity hall, small kitchen, store room, WCs and the parish office. Heating is provided by a gas fired boiler to perimeter radiators throughout. 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
Install SavaWatt devices on fridges and freezers	400	£58	£120	2.05	List A	0.12	£977

Install Endotherm advanced heating fluid into heating system(s)	2,423	£109	£224	2.05	None	0.52	£431
Optimise heating system and strategy	6,057	£210	£600	2.86	None	1.11	£539
Fit flow regulators onto existing taps	428	£62	£200	3.20	List B	0.13	£1,523
Change existing lighting for low energy lamps/fittings	978	£143	£1,963	13.75	List B / Faculty	0.30	£6,534
Fit 270mm of insulation into the loft	2,423	£354	£8,000	22.62	List B / Faculty	0.74	£10,749
Investigate cavity wall insulation	1,938	£67	£3,000	44.63	Faculty	0.36	£8,414
Adjust and Install PIR motion sensors on selected lighting circuits	13	£2	£444	234.20	List B	0.00	£111,306

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

Based on current market prices of 14.6p/kWh and 3.468p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,005 per year.

2. Introduction

This report is provided to the PCC of St Eustachius Parish Centre to provide them with advice and guidance as to how the Parish Centre can be improved to be more energy efficient. In doing so the Parish Centre will also become more cost effective to run and seek to improve the levels of comfort. Where development plans are known, the recommendations in this report have been aligned with them.

An energy survey of the St Eustachius Parish Centre, 5a Plymouth Road, Tavistock, PL19 8AU was completed on the 27th January 2020 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 and a CIBSE Low Carbon Consultant and a fully qualified ISO50001 lead auditor.

St Eustachius Parish Centre	**615599**
Gross Internal Floor Area	176 m^2
Listed Status	Unlisted

The Parish Centre typically used for 13 hours per week for the following activities

Community Use	13 hours per week

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

3. Energy Usage Details

St Eustachius Parish Centre uses 5,835 kWh/year of electricity, costing in the region of £852 per year, and 28,502 kWh/year of gas, costing £988.

This data has been taken from a summary of consumption provided by the PCC. St Eustachius Parish Centre has one main electricity meter, serial number E15UP02980. There is one gas meter serving the site, serial number M016A05826 14 A6.

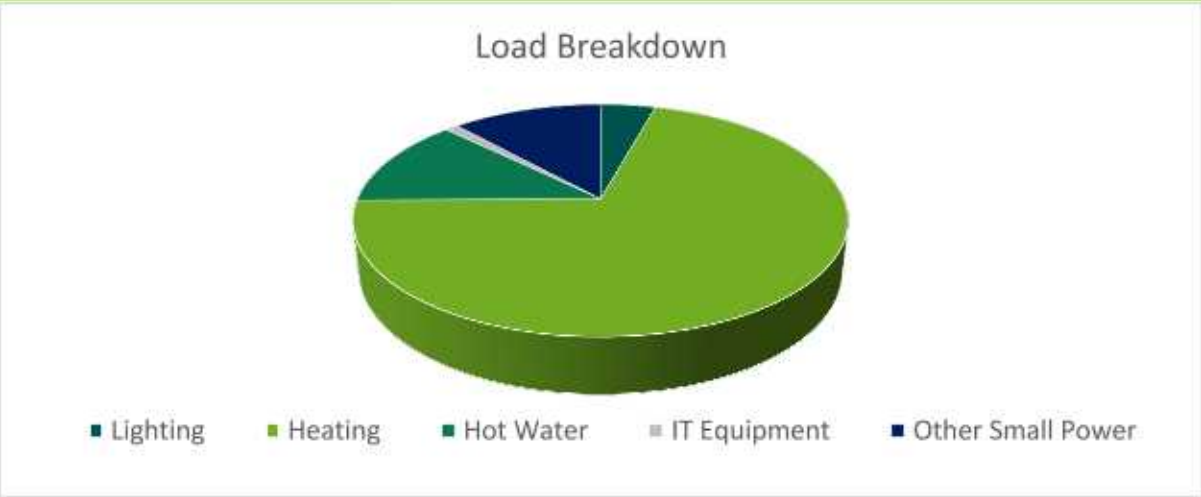
Utility	Meter Serial	Type	Pulsed output	Location
Electricity	E15UP02980	1 phase 100A	Yes but no AMR connectivity	Cupboard in parish office
Gas	M016A05826 14 A6		Yes, fully AMR connected	Cupboard in parish office

It is recommended that the Parish Centre 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.

3.1 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 tube fittings throughout.	4%
Heating	Provided by gas fired condensing boiler distributed through perimeter panel radiators	71%
Hot Water	Provided from the gas fired combi boiler	12%
IT Equipment	Parish office computers and printer	1%
Other Small Power	Small kitchen appliances and other plug loads.	12%



As can be seen from this data, the heating makes up by far the largest proportion of the energy usage on site. The other significant loads are hot water and small power.

3.2 Energy Benchmarking

In comparison to national benchmarks[1] for energy use, St Eustachius Parish Centre uses 66% more electricity and 8% more heating energy than would be expected for a church hall of this size. This is likely due to the inefficient lighting within the Parish Centre and the fact that the heating remains on constantly.

	Size (m^2 GIA)	St Eustachius Parish Centre use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Eustachius Parish Centre (elec)	176	33.15	20	10	66%
St Eustachius Parish Centre (heating fuel)	176	161.94	150	80	8%
TOTAL	176	195.10	170	90	15%

[1] CofE Shrinking the Footprint – Energy

4. Energy Saving Recommendations (Electricity)

4.1 Lighting (fittings)

The lighting makes up a relatively small overall energy load within the building, and all areas are lit by inefficient fittings. The ceiling lights in the main hall, kitchen and parish office are inefficient T8 fluorescent tube fittings, whereas the WCs, lobby and store room use 2D bulkhead fittings. 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.

If all the lights were changed the total capital cost (supplied and fitted) would be £1,963. The annual cost saving would be £143 resulting in a payback of around 13.75 years. Many of the lights could be self-installed and therefore cost much less than the supply and fit cost above.

4.2 Lighting (control for internal lights)

There are several lights which currently remain on all the time that the building is in use in areas such as store rooms, toilet areas, the kitchen and the like. Some of these areas are only used occasionally and for a short amount of time and as such, the light does not need to remain on constantly. There are also spaces which benefit from a good amount of natural daylight coming in through the windows where artificial lighting is not required for much of the year during the day.

It is recommended that a motion sensor is installed on these specific lighting circuits 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.

4.3 Refrigeration Controls

Within the kitchen there is a domestic refrigeration unit for storage of milk and food. 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.

The supply and installation of these units and further details can only be undertaken by SavaWatt directly http://savawatt.com/. The installation does not cause any significant disruption to operations and can be undertaken during normal operating times.

5. Energy Saving Recommendation (Heating)

5.1 Heating System and Strategy

The Parish Centre currently uses a gas fired condensing boiler to heat the parish centre via perimeter panel radiators. This is reported to work reasonably well and provides adequate thermal comfort into the centre, although it was reported that this was taking time to reach the set temperature (on the wall mounted thermostat).

Given the usage profile of the centre, we would suggest that a revised heating strategy for the centre would provide a much more efficient use of energy and a more comfortable space.

Providing constant background heating to the parish centre as a whole at a level of 17°C is excessive and wasteful of energy. We would recommend that this background level is avoided altogether and the time clock that is on the boiler utilised to match the times when the centre is occupied. This may require adjustment to the timeclock to allow sufficient time for the boiler to heat the space up to the required set temperature, but the current 24/7 operation more likely than not means the boiler runs continuously overnight during winter.

The parish office is a cellular space within the centre and the personnel who work here would benefit from a separate electric heating system. 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.

5.2 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 flat roof of the parish centre was not inspected but was reported to have little or no insulation present. As the insulation levels are considered to be poor due to the age of construction of the building, 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.

Due to the nature of the flat roof construction, one solution may be to consider an inverted deck where the layer of insulation sits above the waterproof membrane with a ballast on top. This would require roofing contractors to explore the current roof structure and feasibility of this system. Alternatively, the most pragmatic approach to insulating the roof is to wait for any additional roofing repairs or works to be completed at the same time.

6.2 Wall Insulation

The building is constructed with a cavity wall method and the inspection of the wall showed no signs that insulation has been added. Prior to the early 1990's cavity walls did not require to be insulated and therefore it is likely that there is no insulation present but it could be added through injecting it into the cavity walls.

It is recommended that cavity wall insulation is considered and added to the walls where appropriate. A survey to check the width of the cavity, exposure of the wall and condition of the cavity should be carried out by a CIGA approved installer who will then be able to provide you with a quotation to undertake the works. Installing cavity wall insulation will help to reduce heat loss and improve the comfort of the space, but needs to be considered alongside other control measures such as TRV's or room sensors to ensure that the space does not overheat because of the additional insulation.

A free survey and quotation for the supply and installation of insulation to the loft spaces can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 9309689, adrian@esos-energy.com).

7. Saving Recommendations (Water)

7.1 Tap Flow Regulators

The taps to the wash hand basins within the building have been checked as part of the audit and the average flow rate within these has been measured to be 11l/min. The recommended flow rate for hand washing is 4.8l/min and therefore the taps are providing around double the amount of water that is necessary.

The over provision of water for hand washing is not only a source of excessive water use, but in the case of hot water, it is also a source of wasted energy in the heating that has to go into providing the hot water.

The flow rate of the taps can be easily regulated by fitting flow regulators within the taps. It is recommended that flow regulators such as those manufactured by neoperl (http://www.neoperl.net/en/) are fitted into all the viable hand wash basin taps to save on both water and heating of the hot water.

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, visible roof, some shading
Battery Storage	No – no viable PV
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient and infrequent hot water need
Ground Source Heat Pump	No – archaeology in ground and radiator system
Air Source Heat Pump	No – insufficient electricity supply

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.
2. 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
Parish office	2	5ft Single Proteus LED	£60.86	£254.60	4.18
Reception	1	2D LED 11W	£2.06	£54.55	26.42
WC	4	2D LED 11W	£8.26	£218.20	26.42
Main hall	9	600 x 1200 50W Panel (AG)	£64.95	£1,104.48	17.01
Store room	1	2D LED 7W	£2.06	£54.55	26.42
Kitchen	1	5ft Single LED	£4.55	£93.70	20.58