ESOS-ENERGY
Energy efficient solutions

Energy Audit and Survey Report

St Mary's Church, Rodbourne Cheney

PCC of St Mary's

Version Control

Author	Reviewer	Date	Version
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Contents

1. Executive Summary

An energy survey of St Mary's Church, Rodbourne Cheney 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 by Total Gas & Power, the Parish Buying schemes principal energy suppliers.

St Mary's Church, Rodbourne Cheney is Grade II listed church dating back to around 1250 with numerous extensions throughout its history including a more recent 1960's scheme adding a gallery and vestry extension. 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.

Short Term: 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)
Install PIR motion sensors on selected lighting circuits	48	£6	£340	54.33	List A	0.01
Fit Quattroseal draft proofing to historic doors	1,280	£29	£800	27.41	List B	0.24

Medium Term: 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)
Change existing lighting for low energy lamps/fittings	2,347	£308	£11,516	37.37	List B / Faculty	0.72
Fit 270mm of insulation into the loft	6,399	£146	£3,000	20.56	List B	1.18

Long Term: 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)
Install under pew heaters and remove gas boiler	42,900	-£1,310	£25,760	N/A	Faculty	5.29

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

Based on current contracted prices of 13.13p/kWh and 2.28p/kWh for electricity and mains gas respectively.

2. Introduction

This report is provided to the PCC of St Mary's Church, Rodbourne Cheney 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 Mary's Church, Rodbourne Cheney, Cheney Manor Road, Swindon, SN2 2PE was completed on the 28th October 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 Mary's Church, Rodbourne Cheney	
Gross Internal Floor Area	400 m^2
Listed Status	Grade II
Typical Congregation Size	100

The church typically used for 13 hours per week for the following activities

Services	3 hours per week
Meetings and Church Groups	4 hours per week
Community Use	6 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 St Mary's Church, Rodbourne Cheney and have been reviewed against the current market rates for energy.

The current electricity rates are:

Single / Blended Rate	13.13p/kWh	In line with current market rates
Standing Charge	21.3152p/day	N/A

The current gas rates are:

Single / Blended Rate	2.2804p/kWh	Below current market rates
Standing Charge	£2.61/day	N/A

The above review has highlighted that the current rates being paid are in line or below current market levels and the organisation can be confident it is receiving good rates and should continue with their current procurement practices. On renewal we would therefore recommend that the church obtains a quotation for its gas and electricity supplies from the CofE parish buying scheme, https://www.parishbuying.org.uk/index.php/categories/energy/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 Mary's Church, Rodbourne Cheney uses 6,587 kWh/year of electricity, costing in the region of £865 per year, and 63,992 kWh/year of gas, costing £1,460.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Mary's Church, Rodbourne Cheney has one main electricity meter, serial number E14UP03835. There is one gas meter serving the site, serial number 3547476S.

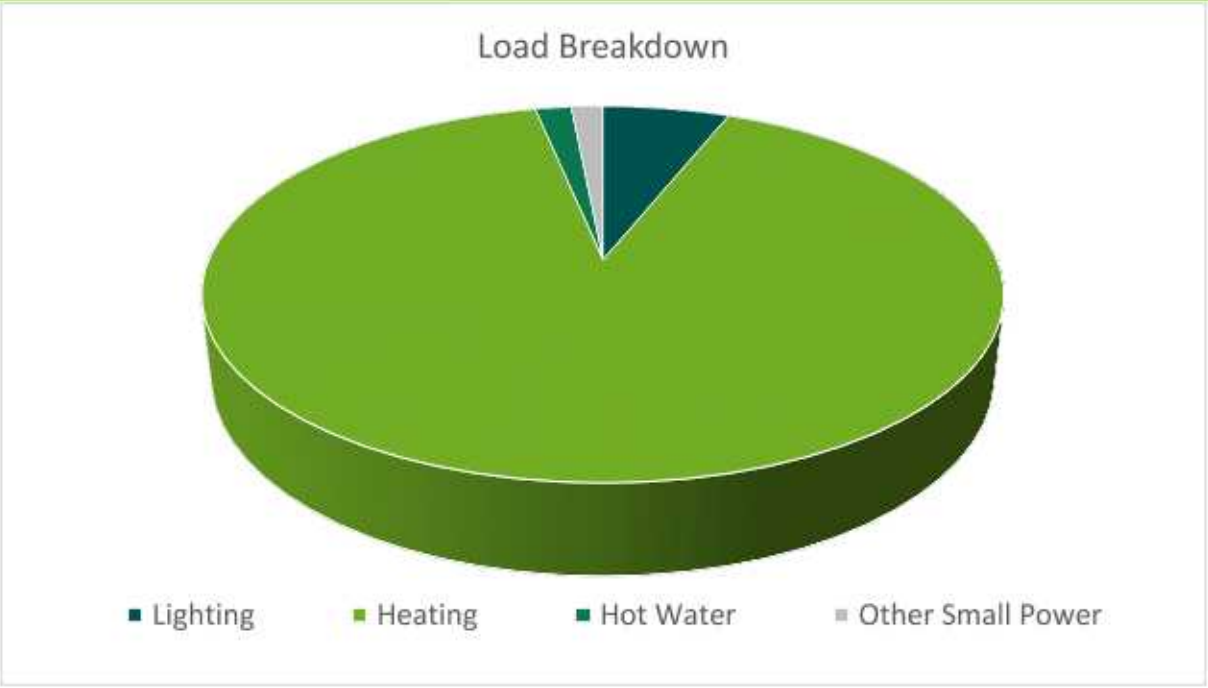
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	E14UP03835	1 phase 100A	Yes	Boxing in corner of side chapel
Gas – Church	3547476S	UGI R5 Cu Ft meter	No	External gas meter enclosure by boundary wall

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	Mainly high energy flood lighting, halogen spots and 2D fittings throughout.	6%
Heating	Gas fired heating from old boiler to old fan convector units	90%
Hot Water	Electric point of use hot water heater under sink	2%
Other Small Power	Organ, sound equipment and other plug in devices.	2%



As can be 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[1] for Church energy use, St Mary's Church, Rodbourne Cheney uses 18% less electricity and 7% more heating energy than would be expected for a church of this size.

	Size (m^2 GIA)	St Mary's Church, Rodbourne Cheney use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Mary's Church, Rodbourne Cheney (elec)	400	16.46	20	10	-18%
St Mary's Church, Rodbourne Cheney (heating fuel)	400	159.91	150	80	7%
TOTAL	400	176.37	170	90	4%

[1] CofE Shrinking the Footprint – Energy

5. Energy Saving Recommendations (Electricity)

5.1 Lighting (fittings)

The lighting makes up a relatively significant element of the overall electrical load within the building, and all areas are lit by inefficient fittings. The nave and side chapels are lit by high powered flood lights and uplighters but there are two LED flood lights within the chancel.

It is recommended that all of the fittings are changed for LED. This could be undertaken in a direct like of like basis which is what has been costing earlier 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 like for like the total capital cost (supplied and fitted) would be £11,516. The annual cost saving would be £308 resulting in a payback of around 37 years. Some of the lights (the GU10 halogen spotlights for example) could be self-installed and therefore cost much less than the supply and fit cost above.

5.2 Lighting (control for internal lights)

There are several lights which currently remain on all the time the building is occupied in areas such as the porch, WC's and vestry's 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.

6. Energy Saving Recommendation (Heating)

6.1 Heating System and Strategy

The church currently uses an Ideal Concord Series 2 100kW gas boiler to heat the church via fan convector heaters. The boiler should be considered to be at the end of its serviceable life and the fan heaters are also going to start becoming obsolete for spares if required.

There is also a higher than anticipated gas used for this church which would suggest that the gas heating is run for longer periods than the services and other usages. As with most medieval churches, this church would have survived most of its life without any form of heating. The modern additional of heating 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. 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)

As the heating systems starts to fail, it is recommended that the church consider changing to electric under pew heating. This would require a new 3 phase electrical supply to be bought into the church, and investigations on the viability of bringing in an increased electrical supply should be made to the District Network Operator (DNO) now in preparation for any potential works. The DNO is your area is thought to be Western Power Distribution - www.westernpower.co.uk; 0800

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

would need to be carefully considered (all cabling should be in armoured cable or FP200 Gold when above ground) but could be achieved by lifting and notching out the back of the parquet flooring blocks under the pews.

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

7. Energy Saving Measures (Building Fabric)

7.1 Roof Insulation

There is reported to be a void between the pitched external slope of the roof and the panelled barrel roof internally. If accessible, this void could have insulation quilt added to in it laid on top of the barrel roof panelling. This would help to improve the thermal comfort of the church and helps to reduce draughts. The insulation could be carried out by any good local building company or as a DIY solution but should be carried out under the direction of the church architect, so that issues around ventilation etc. are considered.

7.2 Draught Proofing 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 into the church around the side and base of these doors.

Where a timber door closes against a timber frame it is recommended that draught proofing is fitted. 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. Note this cannot be used where the timber door closes directly against a stone surround.

Other simple measures such as using a small fridge magnet painted black over the large keyhole or the use of 'sausage dog' type draught excluders at the base of little used doors can prove to be very effective. Doors should be reviewed in daylight and gaps where the light shines through sealed or filled in whatever the most appropriate way is for the specific door.

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
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 – 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-Jan-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.