



# Energy Audit Report for St. Michael & All Angels Church



Site Address	St. Michael & All Angels Church, Cleveland,TS20 2EW
Church Code	613311
Author	Tim Mawby Graduate Consultant
Date	11th December 2019
Version	1.0



# 1 Executive Summary

An energy survey of St. Michael & All Angels Church, Imperial Avenue, Stockton-On-Tees, Cleveland, TS20 2EW 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.

This energy audit has been undertaken by a suitably qualified and experienced energy auditor. Benefits of implementing the opportunities identified in this Report include a reduction in energy costs in the first instance, but could also reduce other costs, increase staff awareness and engagement, and improve comfort and staff satisfaction in the workplace.

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 Measure	Annual Energy Savings (kWh)	Annual Cost Savings (£)	Estimated Capital Cost	Payback Period (Years)	Annual Carbon Savings (Tonnes CO2e)
Use timer on boilers (estimated 20% saving)	8,742	£184	£0	0	1.8
Ensure that the pipes are properly insulated (estimated 3% saving)	1,311	£27	£100	3.7	0.3
Entrance – replace 20W bulbs in chandelier with 3.5W LED alternatives	96	£13	£40	3.1	<0.1
Entrance – replace 20W bulbs with 3.5W LED alternatives.	24	£3	£10	3.3	<0.1
Vestry – replace 58W fluorescent tubes with 22W LED alternatives	340	£45	£260	5.7	<0.1
Vestry – replace 40W bulbs with 3.5W LED alternatives	53	£7	£10	1.4	<0.1
WC – replace 36W light with a 7.5W alternative	21	£3	£10	3.3	<0.1
TOTALS	10,587	£282	£420	1.5	2.1

The headline messages from the audit are:

- ▲ £420 investment in energy reduction measures would achieve an estimated annual saving of 10,587kWh (combined electric and gas).
- ▲ Based on current electricity and gas tariffs, this would result in an annual financial saving of £282.
- ▲ The simple payback period on this investment is 1.5 years.

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



# 2 Church Information

A site survey was undertaken by Tim Mawby on Monday 9th December 2019. The survey was non-invasive (visual only) and entailed a general walk throughout the church areas, including back of house spaces and plant rooms





General Information			
Site Address	St. Michael & All Angels Church, Stockton-On-Tees, Cleveland,		
	TS20 2EW		
Listed Status	Grade 2 Listed		
Building Age	Built in 1913		
Floor Area	420 sqm		
Usage	Typically 14 hours per week		



# 3 Energy Procurement Review

Energy bills for gas and electricity have been supplied and have been reviewed against the current market rates for energy.

## 3.1 Electricity

Day Rate	13.29 p/kWh
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#### 3.2 Gas

Rate	2.11 p/kWh
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The review has highlighted that there may be opportunities to gain environmental benefits from improved procurement of the energy supplies at this site.

We would therefore recommend that the Church obtains a quotation for its gas and electricity supplies from the CofE Parish Buying scheme (<a href="https://www.parishbuying.org.uk/categories/energy/energy-basket">https://www.parishbuying.org.uk/categories/energy/energy-basket</a>). This scheme only offers renewably sourced energy and therefore it is an important part of the process of making Churches more sustainable.

# 4 Energy Usage Details

## 4.1 Cost & Consumption

Energy Type	Annual kWh
Gas	56,080
Electricity	2,317

If not already in place, 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 in use.

#### 4.2 Energy Benchmarking (Based on CofE Shrinking the Footprint – Energy)

Energy Type	Size (Sqm)	Benchmark Energy Use (kWh/Sqm)	Actual Energy Use (kWh/Sqm)	Variance from Benchmark (%)
Gas	420	105	133	27%
Electricity	420	20	6	-70%

The Church is using more Gas than expected. The Church is using less Electricity than expected.



5 Building Performance and Opportunities

The building is well run with proactive onsite team in terms of energy conversation with some areas of improvement already being identified. The following sections will highlight where further improvements could potentially be made.

## 5.1 Building Envelope

From visual inspection, the building envelope appears to be in a reasonably good state of repair. As such, no recommendations have been made in this area.

## 5.2 Heating System - Boilers

Heating is provided to the Church via a gas boiler, an Ideal Falcon GTE (photograph 2), it is located in the basement plant room. It was estimated that the boiler is over 6 years old and is used on average around 20 hours per week. There is no timer on this boiler, so it is recommended that this is implemented, to make sure that it is only used when necessary.

A second gas boiler, Ideal Elan 2 (photograph 3) is located in the vestry. It is unclear how old that this boiler is, but it is noted that it is in good condition. This boiler provides heat to the vestry, it does not operate on a timer, so it is recommended that this function is used to avoid it being unintentionally left on when not in use.

It is recommended that the client explores the possibility of installing an air to water heat pump heating system in order to move towards the goal of decarbonising energy consumption.



Photographs 2 & 3: Church Boilers

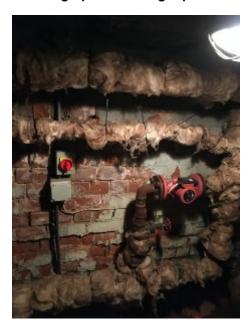


## 5.3 Heating System – Pipework and Distribution

Whilst on-site, it was noted that pipework for heating systems is poorly lagged, therefore not providing sufficient heat retention. It is recommended that sufficient insulation is installed.



Photograph 4: Heating Pipework



# 5.4 Heating System – Heat Emitters

Heating to the church is provided through 7no. cast iron radiators, these radiators are supplied by exposed heating pipes that run throughout the church and under the floors.



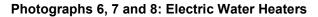
**Photograph 5: Cast Iron Radiator** 

There are an additional 7 radiators in the vestry, which provides heat to this area when required.



## 5.5 Hot Water System

Hot water is provided to the kitchen in the Church area through a Heatstore Multiflow, that is mounted under the sink. There is also an electric Swan hot water heater, which is frequently used for hot drinks. In the WC there is a RedRing Instant 3, which provides hot water to the tap in the bathroom.









## 5.6 Lighting

There is no lighting control system, motion detectors or daylight dimming controls. All light fittings are controlled via manual on/off switches.

The range of light fittings throughout the church areas are detailed below:

#### **Main Church**

- ▲ There is approximately 40no. LED 3.5W lights throughout the Church (photograph 9).
- ▲ The Church is also lit by 1no. LED flood light and 1 Halogen flood light, but these are rarely used.



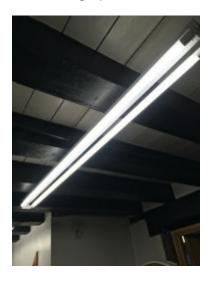


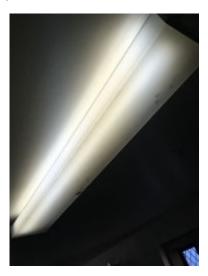


#### Vestry

- ▲ 4no. LED strips (photograph 10)
- ▲ 13no. 58W T8 fluorescent tubes (photograph 11) recommended to be replace with 22W LED alternatives.
- ▲ 2no. 40W lamps recommended to be replaced with 3.5W LED alternatives



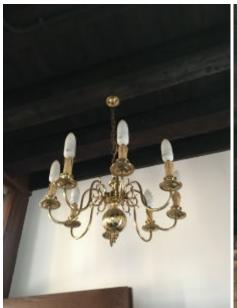




#### **Entrance**

- ▲ 8no. 20W bulbs in a hanging chandelier recommended to be replace with 3.5 LED alternatives.
- ▲ 2no. 20W hangings recommended to be replace with 3.5 LED alternatives.

Photograph 12 & 13: Bulbs at entrance







WC

▲ 1no. 36W compact fluorescent lamp – recommended to be replaced with a 7.5 LED alternative.





# 5.7 Renewables

There are currently no renewables on-site. A free desktop survey can be carried out by a specialist solar installer to identify the possibility of installing solar PV panels.



# **6** Potential Saving Opportunities

As part of the assessment, we carry out a close inspection of M&E plant and their associated controls, with the aim of identifying any issues that have significant impact on energy consumption and correct building operation. We have reviewed the building and associated HVAC and lighting operations and identified the following potential energy conservation opportunities (ECOs), which should be investigated:

	Actions	Potential Annual Savings			Investment	Simple
Category		Elec/Gas (kWh)	Cost (£)	(tCO <sub>2</sub> )	Investment (£)	payback (yrs.)
Heating	Utilise timer on boilers (estimated 20% saving)	8,742	£184	1.8	£0	0
Heating	Ensure that the pipes are properly insulated (estimated 3% saving)	1,311	£27	0.3	£100	3.7
Lighting	Entrance – replace 20W bulbs in chandelier with 3.5W LED alternatives	96	£13	<0.1	£40	3.1
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Lighting	Lighting Vestry – replace 58W fluorescent tubes with 22W LED alternatives		£45	<0.1	£260	5.7
Lighting	Vestry – replace 40W bulbs with 3.5W LED alternatives	53	£7	<0.1	£10	1.4
Lighting	WC – replace 36W light with 7.5W alternative	21	£3	<0.1	£10	3.3
TOTAL ELECTRICITY SAVINGS		534	£71	0.1	£320	4.5
TOTAL GAS SAVINGS		10,053	£211	2.1	£100	0.5
GRAND TOTAL		10,587	£282	2.1	£420	1.5

# 7 Assumptions

## 7.1 Assumptions

- ▲ The lighting costs excludes labour, installation and access which will require the confirmation of a specialist lighting contractor.
- ▲ Average cost of electricity at 13.29/kWh.
- Average cost of gas at 2.11p/kWh.
- ▲ Electricity carbon emission rate of 0.31598 kgCO₂/kWh.
- ▲ Natural Gas carbon emission rate of 0.20776 kgCO₂/kWh.



#### 7.2 Economic Life

CIBSE Guide M Appendix 12.A1 gives the economic life of plant common plant items. After this time the maintenance and repair make it economic to replace the asset. There will be energy savings inherent in the new equipment and the need to meet the minimum requirements of the Building Regulations. Some capital plant has long payback periods, when based on energy efficiency alone, but these should be part of an asset replacement programme with only the 'additional' cost of higher than minimum required energy standards being used to calculate ROI.

## 7.3 Implementation

Reviews of energy projects and initiatives are designed to provide a high-level indication of options available clients and will not constitute a recommendation for implementation. Pricing and potential savings are indicative values and will not constitute an offer.

## 7.4 Cumulative Savings and Double Counting

It should be noted that further investigation may rule out some measures as impractical, either physically or financially. Some measures are mutually exclusive and provide diminishing returns if implemented together. For example, if the lighting load is reduced through more efficient lighting, there will be an increase in the heat demand on boilers, as the new lights generate less heat.

Each energy conservation measure is assessed independently at this stage so that they can be fairly compared. An assessment of any overlap will be undertaken once any projects are selected for implementation.

# 8 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

# 9 Faculty Requirements

It must be noted that all works intended to be undertaken should be discussed with the DAC at the Diocese.

Minor works 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.

Major 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,

## 10 Limitations

The recommendations contained in this Report represent ESOS Energy's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Sustainability Consultant.

ESOS Energy obtained, reviewed and evaluated information in preparing this Report from the Client and others. ESOS Energy conclusions, opinions and recommendations has been determined using this information. ESOS Energy does not warrant the accuracy of the information provided to it and will not be responsible for any



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