



Energy Audit Report for St. Michael & All Angels Church



Site Address	St. Michael & All Angels Church, Houghton le Spring, DH4 4DN
Church Code	613099
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1 Executive Summary

An energy survey of St. Michael & All Angels Church, Church Street, Houghton le Spring, DH4 4DN 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 it 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 CO ₂ e)
Replace the older existing boiler with a new condensing gas boiler (90% efficiency)	10,918	£326	£1,100	3.4	2.3
Chapel - replace 25W CFLs with 7.5W LED alternatives	273	£46	£125	2.7	0.1
Vestry - replace 58W fluorescent tubes with 22W LED alternatives	90	£15	£40	2.7	<0.1
Vestry - replace 25W CFLs with 3.5W LED alternatives	40	£7	£15	2.1	<0.1
Office - replace 58W fluorescent tubes with 22W LED alternatives	90	£15	£40	2.7	<0.1
Heritage Centre - replace 25W CFLs with 3.5W LED alternatives	81	£14	£30	2.1	<0.1
TOTALS	11,492	£423	£1,350	3.2	2.4

The headline messages from the audit are:

- ▲ £1,350 investment in energy reduction measures would achieve an estimated annual saving of 11,492kWh (combined electric and gas).
- ▲ Based on current electricity and gas tariffs, this would result in an annual financial saving of £423.
- ▲ The simple payback period on this investment is 3.2 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 Wednesday 14th November 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.

Photograph 1: St. Michael & All Angels Church External View



General Information	
Site Address	St. Michael & All Angels Church, Church Street, Houghton le Spring, DH4 4DN
Listed Status	Grade 1 Listed
Building Age	Built in 1881
Floor Area	Unknown
Usage	Typically 12 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	16.85 p/kWh
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3.2 Gas

Rate	2.99 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 (<https://www.parishbuying.org.uk/categories/energy/energy-basket>). 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	145,575
Electricity	8,179

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	885	105	164	56%
Electricity	885	20	9	-45%

The building is using more gas than expected. The building 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 4no. boilers. A gas fired Ideal Concord CX boiler (photograph 2) is located in the plant room. It is unclear how old the boiler on-site is, however during the site visit it was noted that the unit is approaching the end of its serviceable life, (assumed to be 20 years old). Based on this, it is assumed that the efficiency of the boiler may have dropped to as little as 60%. As such, it is recommended that the boiler is replaced with a high efficiency gas condensing boiler.

A Worcester gas combination boiler (photograph 3) was installed in 2009 and is located in the vestry. This boiler has been programmed to operate for 2-hours per day.

2no. 60kW Remeha gas combination boilers (photograph 4) were installed in a cupboard in the back of house entrance in 2015. These serve the main church area. These boilers are operated via a control panel situated in the vestry, where a timer is programmed to turn the boilers on depending on the planned weekly occupancy hours. The boilers' controls allow for a manual override so that they can be switched on outside of these hours. As such, no recommendations have been made in this area.

Photographs 2, 3 & 4: Church Boilers



5.3 Heating System – Pipework and Distribution

The heating systems' plant room pipework is generally good, with insulating lagging in good condition. As such, no recommendations have been made in this area.

Photograph 5: Heating Pipework



5.4 Heating System – Heat Emitters

Heating to the church is served via 11no. wall-mounted radiators. These radiators are supplied by heating pipes running in floor trenches covered with grilles. Radiators are typically obstructed by furniture which limits the effectiveness of the heating. It is advised that items are removed from the immediate vicinity to allow for better heat convection in the space.

A range of portable plug-in heaters are also present throughout the building and are used to provide additional heating to the smaller rooms when required.

5.5 Hot Water System

Hot water is supplied to the building via a Newlec electric water heater. This supplies kitchen and WC areas. A Zip Hydroboil electric point of use water heater is also present in the kitchen. Hot water usage is considered to be nominal.

Photograph 5: Electric Water Heater



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:

Chapel

- ▲ Approximately 25no. 25W compact fluorescent lamps – recommended to be replaced with 3.5W LED alternatives.

Photograph 6: Compact Fluorescent Lamps



Vestry

- ▲ 4no. 58W fluorescent tubes – recommended to be replaced with 22W LED alternatives.
- ▲ 3no. 25W compact fluorescent lamps – recommended to be replaced with 3.5W LED alternatives.

Photographs 7 & 8: Fluorescent Tubes



Office

- ▲ 4no. 58W fluorescent tubes – recommended to be replaced with 22W LED alternatives.

Photograph 9: Fluorescent Tubes



Heritage Centre

- ▲ 6no. 25W fluorescent lamps – recommended to be replaced with 3.5W LED alternatives.

Photograph 9: Fluorescent Lamps



5.7 Renewables

There are currently no renewables on-site. Further investigation rules out the installation of any potential renewable energy sources due to current consumption and the building's potential listed status. For further advice, a free desktop survey can be carried out by a specialist solar panel installer.

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:

Category	Actions	Potential Annual Savings			Investment (£)	Simple payback (yrs.)
		Elec/Gas (kWh)	Cost (£)	(tCO ₂)		
Heating	Replace the older existing boiler (photograph 2) with a new condensing gas boiler (90% efficiency)	10,918	£326	2.3	£1,100	3.4
Lighting	Chapel - replace 25W CFLs with 7.5W LED alternatives	273	£46	0.1	£125	2.7
Lighting	Vestry - replace 58W fluorescent tubes with 22W LED alternatives	90	£15	<0.1	£40	2.7
Lighting	Vestry - replace 25W CFLs with 3.5W LED alternatives	40	£7	<0.1	£15	2.1
Lighting	Office - replace 58W fluorescent tubes with 22W LED alternatives	90	£15	<0.1	£40	2.7
Lighting	Heritage Centre - replace 25W CFLs with 3.5W LED alternatives	81	£14	<0.1	£30	2.1
TOTAL ELECTRICITY SAVINGS		574	£97	0.2	£250	2.6
TOTAL GAS SAVINGS		10,918	£326	2.3	£1,100	3.4
GRAND TOTAL		11,492	£423	2.5	£1,350	3.2

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 16.85p/kWh.
- ▲ Average cost of gas at 2.99p/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 as 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 opinions

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