



# Energy Audit Report for Christ Church Friezland – Church Hall



Site Address	Christ Church Hall, Friezland, OL3 7LQ
Church Code	624270
Author	Tim Mawby Graduate Consultant
Date	21 <sup>st</sup> January 2020
Version	1.0

## Contents

1	Executive Summary .....	3
2	Church Information.....	4
3	Energy Procurement Review.....	5
3.1	Electricity .....	5
3.2	Gas.....	5
4	Energy Usage Details .....	5
4.1	Cost & Consumption .....	5
4.2	Energy Benchmarking (Based on CofE Shrinking the Footprint – Energy) .....	5
5	Building Performance and Opportunities.....	6
5.1	Building Envelope .....	6
5.2	Heating System – Boilers.....	6
5.3	Heating System – Pipework and Distribution.....	6
5.4	Heating System – Heat Emitters .....	7
5.5	Hot Water System .....	8
5.6	Lighting.....	8
5.7	Renewables.....	10
6	Potential Saving Opportunities .....	11
7	Assumptions.....	12
7.1	Assumptions.....	12
7.2	Economic Life.....	12
7.3	Implementation.....	12
7.4	Cumulative Savings and Double Counting .....	12
8	Funding Sources .....	12
9	Faculty Requirements .....	12
10	Limitations .....	13

## 1 Executive Summary

An energy survey of Christ Church Hall, Friezland, OL3 7LQ 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 <sub>2</sub> e)
Church Hall – replace ceiling panels with LED alternatives.	3,295	£329	£400	1.2	1.0
Church Hall – replace fluorescent wall fittings with LED alternatives.	604	£60	£80	1.3	0.2
Church Hall – replace halogen spotlights with LED alternatives.	515	£51	£90	1.8	0.2
Small Hall – replace fluorescent tubes with LED alternatives.	330	£33	£40	1.2	0.1
Small Hall – replace fluorescent lamps with LED alternatives.	302	£30	£40	1.3	0.1
Kitchen – replace fluorescent tubes with LED alternatives.	165	£16	£20	1.3	<0.1
Entrance Corridor – replace halogen lamps with LEDs.	801	£80	£60	0.8	0.3
WC – replace CFLs with LED alternatives.	522	£52	£80	1.5	0.2
Storeroom – replace fluorescent lamps with LED alternatives.	76	£8	£10	1.3	<0.1
<b>TOTAL SAVINGS</b>	<b>6,610</b>	<b>£661</b>	<b>£820</b>	<b>1.2</b>	<b>2.1</b>

The headline messages from the audit are:

- ▲ £820 investment in energy reduction measures would achieve an estimated annual saving of 6,610kWh (combined electric and gas).
- ▲ Based on current electricity and gas tariffs, this would result in an annual financial saving of £661.
- ▲ The simple payback period on this investment is 1.2 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 Friday 17<sup>th</sup> January 2020. 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: Christ Church Hall External View**



General Information	
Site Address	Christ Church Hall Friezland OL3 7LQ
Listed Status	Not listed
Building Age	Unknown
Floor Area	Approximately 400m <sup>2</sup>
Usage	Typically 44 hours per week

### 3 Energy Procurement Review

Energy bills for electricity and gas have not been supplied. Current market rates for energy have been used to estimate consumption.

#### 3.1 Electricity

Day Rate	10.00 p/kWh
----------	-------------

#### 3.2 Gas

Rate	3.00 p/kWh
------	------------

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.paritybuying.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	Not Supplied
Electricity	Not Supplied

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	400	105	Not Supplied	Not Supplied
Electricity	400	20	Not Supplied	Not Supplied



## 5 Building Performance and Opportunities

The building is well run with proactive on-site 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 reasonable state of repair. All windows contain double-glazing. Wall and roof insulation are not present.

### 5.2 Heating System – Boilers

Heating is provided to the church by a Worcester gas combination boiler (installed in early 2019) located in the plant room. This boiler provides heating to all areas and is operated using a Hive application that allows the user to control the system from their mobile phone, as well as the control panel situated in the main hall. The boiler is currently programmed to be operational for 50 hours per week.

As the boiler is considered to be a new efficient model suitable for the heating demand of the church, no recommendations are made for the replacement of alternative technologies. However, it is recommended that the controls are reviewed regularly to prevent unnecessary usage.

**Photograph 2: Church Boiler**



### 5.3 Heating System – Pipework and Distribution

The heating systems' pipework is in good repair, with well-maintained insulating lagging in good condition – understood to have been installed at the same time as the boiler. As such, no recommendations have been made in this area.

**Photograph 3: Heating System Pipework**



#### **5.4 Heating System – Heat Emitters**

Heating to the main church hall is provided via 8no. iron radiators supplied by heating pipes fixed to the walls. There are also 3no. radiators in WC areas, 2no. radiators in the entrance corridor, 2no. radiators in the small hall and 2no. radiators in the storeroom.

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. This can be an ineffective, inefficient and poorly controlled means of providing space heating, and can easily be left on when unoccupied. It is recommended that a more permanent heating solution be provided to these spaces if and when heating upgrades are undertaken.

**Photograph 4: Church Hall Iron Radiators**



## 5.5 Hot Water System

Hot water is provided to the kitchen and ladies' WC via the Worcester combination boiler in the plant room.

Hot water is supplied to the men's WC by an Ariston electric water heater. A Buffalo electric point of use water heater is also present in the kitchen. Hot water consumption is considered to be minimal.

**Photograph 5: Ariston 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:

### Church Hall

- ▲ 10no. fluorescent ceiling panels – each containing 4no. 58W T8 fluorescent tubes – recommended to be replaced with 22W LED alternatives.
- ▲ 8no. fluorescent wall fittings – each containing 2no. 20W fluorescent bulbs – recommended to be replaced with 3.5W LED alternatives.
- ▲ 6no. 50W halogen spotlights – recommended to be replaced with 12.5W LED alternatives.

**Photographs 6, 7 & 8: Church Hall Lighting**



**Small Hall**



- ▲ 4no. 58W T8 Fluorescent tubes – recommended to be replaced with 22W LED alternatives.
- ▲ 4no. twin 20W fluorescent lamps – recommended to be replaced with 3.5W LED alternatives.

**Photographs 9 & 10: Small Hall Lighting**



**Kitchen**

- ▲ 1no. twin 58W T8 Fluorescent tubes – recommended to be replaced with 22W LED alternatives.

**Entrance Corridor**

- ▲ 4no. 100W halogen wall lamps – recommended to be replaced with 12.5W LED alternatives.

**Photograph 11: Halogen Lamps**



## WC

- ▲ 8no. 36W compact fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

**Photograph 12: Compact Fluorescent Lamps**



## Storeroom

- ▲ 2no. 20W fluorescent lamps – recommended to be replaced with 3.5W LED alternatives.

**Photograph 13: Fluorescent Lamps**



## 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:

Category	Actions	Potential Annual Savings			Investment (£)	Simple payback (yrs.)
		Elec/Gas (kWh)	Cost (£)	(tCO <sub>2</sub> )		
Lighting	Church Hall – replace 4x58W ceiling panels with 22W LED alternatives.	3,295	£329	1.0	£400	1.2
Lighting	Church Hall – replace 2x20W fluorescent wall fittings with 3.5W LED alternatives.	604	£60	0.2	£80	1.3
Lighting	Church Hall – replace 50W halogen spotlights with 12.5W LED alternatives.	515	£51	0.2	£90	1.8
Lighting	Small Hall – replace 58W fluorescent tubes with 22W LED alternatives.	330	£33	0.1	£40	1.2
Lighting	Small Hall – replace 2x20W fluorescent lamps with 3.5W LED alternatives.	302	£30	0.1	£40	1.3
Lighting	Kitchen – replace 2x58W fluorescent tubes with 22W LED alternatives.	165	£16	<0.1	£20	1.3
Lighting	Entrance Corridor – replace 100W halogen lamps with 12.5W LED alternatives.	801	£80	0.3	£60	0.8
Lighting	WC – replace 36W CFLs with 7.5W LED alternatives.	522	£52	0.2	£80	1.5
Lighting	Storeroom – replace 20W fluorescent lamps with 3.5W LED alternatives.	76	£8	<0.1	£10	1.3
<b>TOTAL ELECTRICITY SAVINGS</b>		<b>6,610</b>	<b>£661</b>	<b>2.1</b>	<b>£820</b>	<b>1.2</b>
<b>TOTAL GAS SAVINGS</b>		<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
<b>GRAND TOTAL</b>		<b>6,610</b>	<b>£661</b>	<b>2.1</b>	<b>£820</b>	<b>1.2</b>

## 7 Assumptions

### 7.1 Assumptions

- ▲ Cost excludes labour, installation and access which will require the confirmation of a specialist contractor.
- ▲ Average cost of electricity at 10.00p/kWh.
- ▲ Average cost of gas at 3.00p/kWh.
- ▲ Electricity carbon emission rate of 0.31598 kgCO<sub>2</sub>/kWh.
- ▲ Natural Gas carbon emission rate of 0.20776 kgCO<sub>2</sub>/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 which ESOS Energy has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by ESOS Energy for the sole and exclusive use of the Client and for the specific purpose for which ESOS Energy was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and ESOS Energy, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, ESOS Energy does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless ESOS Energy from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.