ESOS-ENERGY
Energy efficient solutions

Energy Audit Report for Christ Church, Pennington

Site Address	Christ Church Pennington, Scofield Street, Leigh, WN7 4HT
Church Code	624108
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Date	20th February 2020
Version	1.0

1 Executive Summary

An energy survey of Christ Church Pennington, Scofield Street, Leigh, WN7 4HT 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 CO_2e)
Install insulating lagging to existing boiler pipework (2% saving)	244	£6	£100	17.0	<0.1
Main Church – replace 28W fluorescent lamps with 7.5W LEDs	489	£64	£510	8.0	<0.1
Foyer – replace 75W bulbs with 10.5W LED alternatives.	604	£79	£200	2.5	<0.1
Entrances – replace 28W fluorescent lamps with 7.5W LEDs	58	£7	£60	8.5	<0.1
Toilets – replace 28W fluorescent lamps with 7.5W LED alternatives	29	£4	£30	7.5	<0.1
Hodson Room - replace 28W fluorescent lamps with 7.5W LEDs	58	£7	£60	8.5	<0.1
Vestry – replace 65W T8 fluorescent tubes with 22W LED alternatives	20	£3	£10	3.5	<0.1
Basement – replace 28W fluorescent lamps with 7.5W LEDs	19	£2	£20	10.0	<0.1
TOTALS	**1,521**	**£172**	**£990**	**6.0**	**0.1**

The headline messages from the audit are:

- £990 investment in energy reduction measures would achieve an estimated annual saving of 1,521Wh (combined electric and gas).
- Based on current electricity and gas tariffs, this would result in an annual financial saving of £172.
- The simple payback period on this investment is 6.0 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 Ros Harwood on Thursday 20th February 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 Pennington External View

General Information	
Site Address	Christ Church Pennington, Scofield Street, Leigh, WN7 4HT
Listed Status	Grade II Listed
Building Age	Unknown – approximately 1240 (Grade II listed)
Floor Area	Approximately 475m^2
Usage	Typically 9 hours per week

3 Energy Procurement Review

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

3.1 Electricity

Day Rate	16.34p/kWh

3.2 Gas

Rate	2.56p/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.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	73,495
Electricity	3,847

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	475	105	154	46%
Electricity	475	20	8	-60%

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 reasonable state of repair. Wall and roof insulation are not present.

5.2 Heating System – Boilers

Heating is provided to the church via 2no. gas condensing boilers, one located in the foyer (Ideal Logic+) and one located in the basement (Lamborghini Caloreclima). Each boiler serves a different area; the first serving the foyer, kitchen, toilet, welcome area and Hodson Room; the other serves the church and the vestry. The boilers are programmed to the church's usage, approximately 9 hours a week, to allow the building the be heated to the desired temperature for when the demise is scheduled to be occupied. Control panels are located on each of the boilers. The temperature and the schedule are kept the same, however manual override is possible if required so that the system can be switched on outside of the programmed hours, as well as the changing of the temperature set point. The control panel for the boiler in the basement is located in the vestry and controls two separate systems, one for the chapel and one for the church.

While the boilers appear to be in good order and are not at the end of its expected lifetime the client may wish to explore the possibility of installing an air to water heat pump heating system in order to move towards the goal of decarbonising energy consumption.

Photograph 2&3: Church Boilers

5.3 Heating System – Pipework and Distribution

The heating systems' pipework is generally good, however there was no insulation lagging on the pipework for the first boiler and some insulation lagging on the pipework for the second boiler. It is recommended that insulating lagging is fitted to the boilers' pipework to reduce heat loss into the foyer and through the basement.

Photograph 4&5: Heating Pipework

5.4 Heating System – Heat Emitters

Heating to the church is predominantly served via radiators supplied by heating pipes fixed to the walls. There are 3no. radiators in the foyer, 2no. radiators in the foyer toilets, 1no. radiator in the Hodson Room, 1no. radiator on the balcony and 3no. radiators in the chapel. There are radiators in the church space that are supplied by pipes along the walls and under the floor in grills. The heating is programmed in the foyer and foyer toilets, the heating in the church space is switched on and off manually as required by individual thermostatic valves. The radiators in the chapel are supplied by a separate system to the church but via the same boiler.

Photographs 6&7: Church Heat Emitters

5.5 Hot Water System

Hot water is provided to the building via Aquapoint III water heaters, one serving the kitchen in the Hodson Room and one serving the toilets. There is also a Supreme Heatrae Sadia 7.5L 2.3-2.5kW electric point of use water heater located in the kitchen in the Hodson Room. Hot water consumption is considered to be nominal.

Photograph 8: Point-of-Use Water Heater

Photograph 9 : Aquapoint III 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 and community centre areas are detailed below. It is assumed the lighting is used 9 hours a week when the building is in use.

Main Church

- 5no. 100W LED floodlights
- 51no. 28W fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

Photographs 10&11: Church Light Fittings

Foyer

- 20no. 75W bulbs – recommended to be replaced with 10.5W LED alternatives.

Photographs 12&13: Foyer Light Fittings

Entrances

- 6no. 28W fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

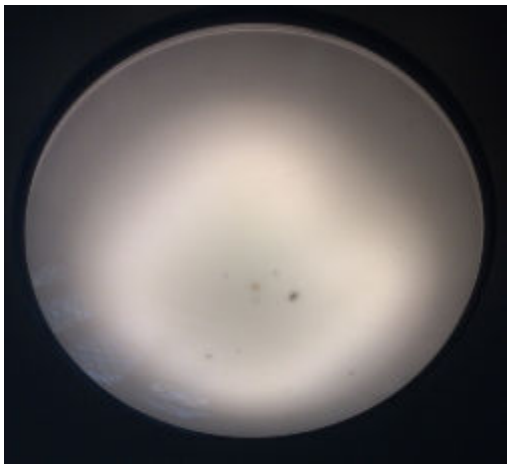
Toilets

- 3no. 28W fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

Hodson Room

- 6no. 28W compact fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

Photograph 14: Compact Fluorescent Lamp (CFL)



Vestry

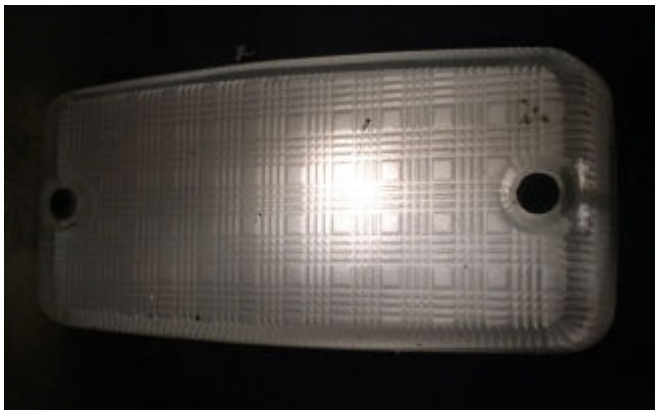
- 1no. 65W fluorescent T8 tubes – recommended to be replaced with 22W LED alternatives.

Photograph 15: T8 Fluorescent Tube

Basement

- 2no. 28W fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

.**Photograph 16: 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_2)		
Heating	Install insulating lagging to the existing boiler pipework (2% saving)	244	£6	<0.1	£100	17.0
Lighting	Main Church – replace 28W fluorescent lamps with 7.5W LEDs	489	£64	<0.1	£510	8.0
Lighting	Foyer – replace 75W low-energy bulbs with 10.5W LED alternatives.	604	£79	<0.1	£200	2.5
Lighting	Entrances – replace 28W fluorescent lamps with 7.5W LEDs	58	£7	<0.1	£60	8.5
Lighting	Toilets – replace 28W fluorescent lamps with 7.5W LED alternatives	29	£4	<0.1	£30	7.5
Lighting	Hodson Room - replace 28W fluorescent lamps with 7.5W LEDs	58	£7	<0.1	£60	8.5
Lighting	Vestry – replace 65W T8 fluorescent tubes with 22W LED alternatives	20	£3	<0.1	£10	3.5
Lighting	Basement – replace 28W fluorescent lamps with 7.5W LEDs	19	£2	<0.1	£20	10.0
TOTAL ELECTRICITY SAVINGS		**1,277**	**£166**	**0.1**	**£890**	**5.5**
TOTAL GAS SAVINGS		**244**	**£6**	**<0.1**	**£100**	**17.0**
GRAND TOTAL		**1,521**	**£172**	**0.1**	**£990**	**6.0**

7 Assumptions

7.1 Assumptions

- Costs excludes labour, installation and access which will require the confirmation of a specialist contractor.
- Average cost of electricity at 16.34p/kWh.
- Average cost of gas at 2.56p/kWh.
- Electricity carbon emission rate of 0.31598 $kgCO_2$/kWh.
- Natural Gas carbon emission rate of 0.20776 $kgCO_2$/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 opinions which ESOS Energy has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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