ESOS-ENERGY
Energy efficient solutions

# Energy Audit and Survey Report

# St Luke's Church Hall

# Trustees of St Luke's Hall, Cheltenham

Version Control

| Author | Reviewer | Date | Version |
|---|---|---|---|
| Matt Fulford | David Legge | 24th November 2019 | 1.0 |

## Contents

## 1. Executive Summary

An energy survey of St Luke's Church Hall 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 from Total Gas & Power, the Parish Buying schemes principal energy suppliers.

St Luke's Church Hall is a single storey church hall building constructed in the 1970's with two hall spaces and associated facilities. There is both gas and electricity supplied to the site.

The church hall 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) | CO2 saving (tonnes of CO2e/year) | Permission needed |
|---|---|---|---|---|---|---|
| Fit timed fused spurs to hot water boiler | 162 | £21 | £90 | 4.32 | 0.05 | None |
| Install SavaWatt devices on fridges and freezers | 560 | £72 | £200 | 2.78 | 0.17 | None |
| Change existing lighting for low energy lamps/fittings | 2,540 | £327 | £2,863 | 8.76 | 0.78 | None |

| Medium Term: Energy saving recommendation | Estimated Annual Energy Saving (kWh) | Estimated Annual Cost Saving (£) | Estimated capital cost (£) | Simple Payback (years) | CO2 saving (tonnes of CO2e/year) | Permission needed |
|---|---|---|---|---|---|---|
| Fit 270mm of insulation into the loft | 2,661 | £124 | £1,600 | 12.86 | 0.49 | None |
| Change to electric point of use water heaters | 7,983 | £373 | £2,800 | 7.50 | 1.47 | None |
| Consider installing PV panels on rear roof pitch (approx. 4kWp) | 3,431 | £441 | £4,500 | 10.20 | 1.05 | Local Authority Planning |
| EV Charger in car park | None | N/A | £600 | N/A | N/A | None |

| Long Term: Energy saving recommendation | Estimated Annual | Estimated Annual | Estimated capital cost (£) | Simple Payback (years) | CO2 saving (tonnes of CO2e/year) | Permission needed |
|---|---|---|---|---|---|---|

| | Energy Saving (kWh) | Cost Saving (£) | | | | |
|---|---|---|---|---|---|---|
| Consider moving to ASHP when boilers fail | TBC | TBC | £8,000 | TBC | TBC | Check with Local Authority |

The Church hall will not fall under the Diocese faculty jurisdiction but anything that affects the external appearance of the building should be checked with the local authority planning department.

Based on current contracted/market prices of 12.86p/kWh and 4.68p/kWh for electricity and mains gas respectively.

**If all measures were implemented this would save the church hall £1,358 per year.**

## 2. Introduction

This report is provided to the Trustees of St Luke's Church Hall to provide them with advice and guidance as to how the church hall can be improved to be more energy efficient. In doing so the church hall will also become more cost effective to run and seek to improve the levels of comfort.

An energy survey of the St Luke's Church Hall, St Luke's Place , Cheltenham GL53 7HP was completed on the 22nd November 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 Luke's Church Hall | |
|---|---|
| Gross Internal Floor Area | 325 $m^2$ |
| Listed Status | Unlisted |

The church hall is extensively used typically used for 115 hours per week

## 3. Energy Procurement Review

Energy bills for gas and electricity have been supplied by St Luke's Church Hall and have been reviewed against the current market rates for energy.

The current electricity rates are:

| | | |
|---|---|---|
| **Day Rate** | 12.306p/kWh | In line with current market rates |
| **Standing Charge** | 36.63p/quarter | N/A |

The current gas rates are:

| | | |
|---|---|---|
| **Single / Blended Rate** | 4.675p/kWh | Above current market rates |
| **Standing Charge** | £6.12/month | N/A |
| **Availability Charge** | p/kVA | N/A |
| **Meter Charges** | p/day | N/A |

The above review has highlighted that there are opportunities to gain cost savings from improved procurement of the energy supplies at this site. We would therefore recommend that the church hall obtains a quotation for its gas 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 and halls 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. |
| **FIT** | 100% charged | A FiT charge is being applied. It should be checked that this is being charged in accordance with the supply contract. |

The above review confirmed that the correct taxation and levy rates are being charged.

# 4. Energy Usage Details

St Luke's Church Hall uses 8,885 kWh/year of electricity, costing in the region of £1,143 per year, and 35,478kWh/year of gas, costing £1,659.

This data has been taken from the annual energy invoices provided by the treasurer of the site. St Luke's Church Hall has one main electricity meter, serial number 217334443. There is one gas meter serving the site, serial number M016A0334211A6.

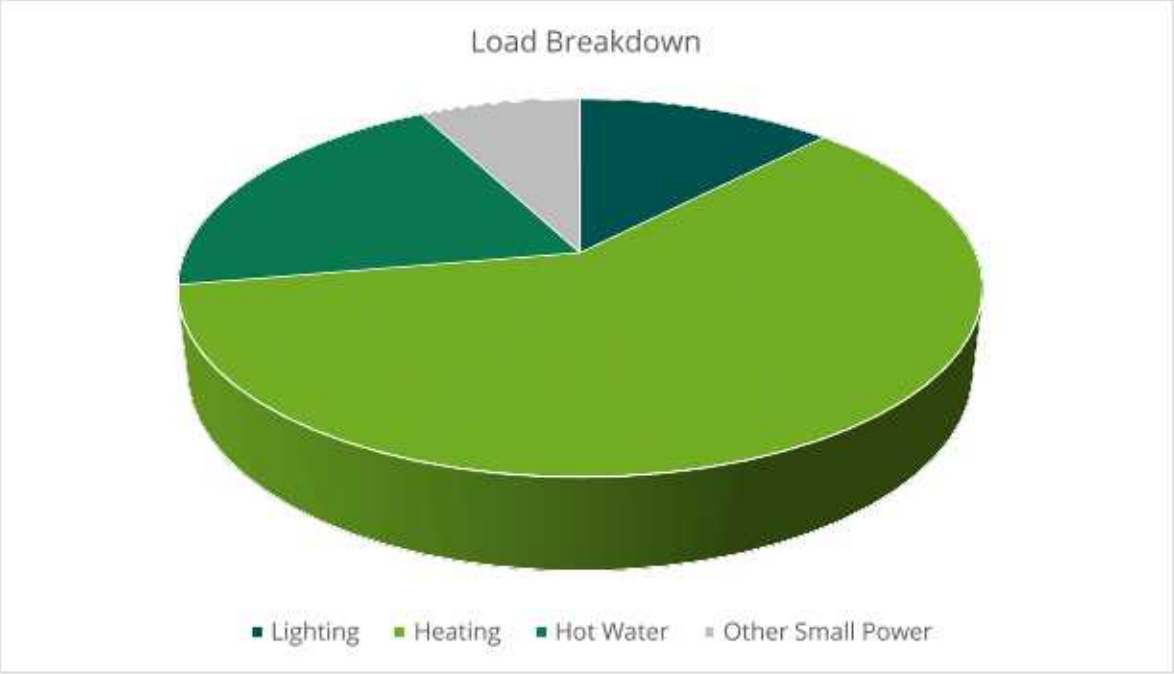
| Utility | Meter Serial | Type | Pulsed output | Location |
|---|---|---|---|---|
| Electricity | 217334443 | 3 phase 100A | Yes | Electrical cupboard off lobby |
| Gas | M016A0334211A6 | MDA 16 | No but capable | External gas meter enclosure |

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 | A mixture of fluorescent lighting in halls and LED's in other areas | 12% |
| Heating | Two gas boilers in attic providing heating to radiators within halls and the like | 60% |
| Hot Water | Indirect Megaflow HWS calorifier in attic storing hot water for WC's and kitchens | 20% |
| Other Small Power | Fridges, kitchen water boiler and other kitchen appliances, other portable electrical items | 8% |




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 Hall energy use, St Luke's Church Hall uses 37% more electricity and 4% more heating energy than would be expected for a church of this size.

| | Size ($m^2$ GIA) | St Luke's Church Hall use kWh | St Luke's Church Hall use kWh/$m^2$ | Benchmark Use kWh/$m^2$ | Variance from Typical |
|---|---|---|---|---|---|
| **St Luke's Church Hall (elec)** | 325 | 8,885 | 27.34 | 20.00 | 37.6% |
| **St Luke's Church Hall (heating fuel)** | 325 | 35,478 | 109.16 | 105.00 | 4.0% |
| **TOTAL** | 325 | 44,363 | 136.50 | 125.00 | 9.2% |

The slighting increase in energy use over benchmarks will be largely a result of the extensive use of the hall but the higher than benchmark electricity use does highlight the need to review the opportunities around energy saving measures such as the LED lighting to the halls.

[1] CIBSE TM46 Benchmark for Public Buildings

# 5. Energy Saving Recommendations (Electricity)

## 5.1 Lighting (fittings)

The lighting makes up a relatively large overall electricity load within the building. Good work has been done to convert the fittings in areas such as the lobby, trough uplights and some in the WC's to LED but the halls and kitchens are lit by relatively inefficient fluorescent fittings.

It is recommended that the fittings scheduled in Appendix 1 are all changed for LED. There are a vast number of specifications of LED lights on the market but it is recommended that any LED light should come with branded chips and drivers and offer a 5 year warranty. An example of such a range of fittings is available from http://www.qvisled.com/

If all the lights were changed the total capital cost (supplied and fitted) would be £2,863. The annual cost saving would be £327 resulting in a payback of around 8.8 years.

The supply and installation can be carried out by any reputable electrical contractor and a free survey and quotation can be obtained from Batchelor Electrical, contact Stuart Patience on 01202 266212;  07793 256684; stuart@batchelor-electrical.co.uk.

## 5.2 Refrigeration Controls

At the hall there are various domestic refrigeration units such as fridges within kitchen areas for storage of milk and food. These units run 24/7 and contribute to the baseload electrical consumption of the building.

To reduce the electrical consumption of these appliances it is recommended that they are all fitted with a SavaWatt unit. These units work by automatically detecting the load of the compressor and turning down the power when it is not in full load. This reduces the energy consumption of the refrigeration unit by around 18% while maintaining the cooling of the appliance. It does this by reducing the voltage delivered to the unit when it is idling but allowing the full energy to the unit when it is required.

Supply and installation and further details can be undertaken by SavaWatt directly http://savawatt.com/. The installation does not cause any significant disruption to operations and can be undertaken during normal operating times.

### 5.3 Timer Fuser Spurs

There is an electric water boiler (for tea making and the like) located in the kitchen. These only need to heat the water to the required temperature when the building is in occupation but at the moment these heaters are directly wired in without any form of time control and therefore maintain their set temperature 24/7.

It is recommended that the heaters are fitted with a 24 hour/7 day timeclock to replace the fused spur switch. An example of such a unit would be a TimeGuard FST77. They should be set up with times to match the times that the building is occupied and this will prevent the standing losses from the unit wasting energy during periods when the building is not occupied.

Such units can be purchased at any electrical wholesaler and fitted by your existing electrician or any NICEIC registered electrical contractor.

## 6. Energy Saving Recommendation (Heating)

### 6.1 Heating System and Strategy

The church hall currently has two gas boilers (located in the attic space) which provide heating to the two separate hall spaces which are triggered by the users pressing a button within the hall when they need heat. While the boilers are now rather old and much less efficient than modern boilers, the overall heating system is relatively efficient and appropriate for the use. While it remains in a working and serviceable condition there is no pressing need to replace it.

When the boilers do fail consideration should be given to moving off gas and on to electric air source heat pumps. While the economics of this does not currently provide a cost (or carbon carbon) form gas boilers this situation is likely to shift considerably over the coming years as the electricity from the national grid becomes significantly less carbon intensive. Some electric panels heaters such https://www.warm4less.com/product/63/1200-watt-platinum-white- would be required to heat the smaller areas such as the committee room.

| Heat Generator | Heat generator efficiency | Type of fuel | Cost of fuel (p/kWh) | Running cost (p/kWh$_{th}$) |
|---|---|---|---|---|
| Air source heat pump | SCoP 3.36 | Electricity | 14.33 | 4.26 |
| Ground source heat pump | SCoP 3.36 | Electricity | 14.33 | 4.26 |
| Electric storage heater | 98% | Electricity | 14.33 | 14.62 |
| Gas boiler | 98% | Gas | 3.63 | 3.70 |
| LPG boiler | 95% | LPG | 6.53 | 6.87 |
| Oil boiler | 95% | Oil | 4.06 | 4.27 |

### 6.2 Hot Water Strategy

The current hot water strategy is that the hot water for the WC's and kitchen is heated from the gas boilers and stored in a small megaflow unit in the attic space.

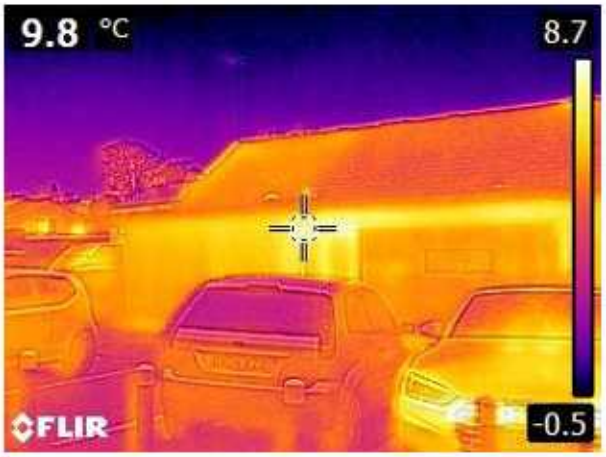
The hot water needs within the building will be relatively small and limited to hand washing in the WC's and minor washing up use in the kitchen (the bulk of which is done via a cold fill glass washer unit).

A far more energy efficient strategy for the hot water would be to have electric point of use water heaters (two 10l units would be needed, one for the WC's and small hall kitchen and one for the main hall kitchen). These units, such as https://www.ariston.com/uk/Electric_Water_Heaters/andrisluxeco only heat the water which is required when the tap is turned on and also help to reduce the water hygiene risk and management requirements.

## 7. Energy Saving Measures (Building Fabric)

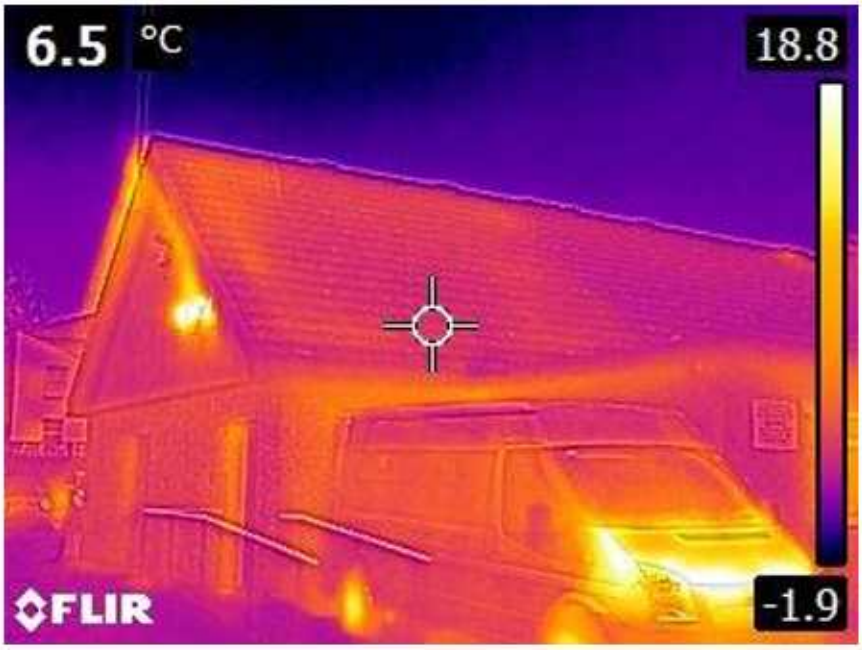
### 7.1 Roof Insulation

The roof structure of the hall is not insulated, and this will be contributing to high heat loss from the roof. This can be seen in particular above the attic space. It is recommended that rockwool type insulation is installed within the roof space between either the rafters or the ceiling joists to help retain heat within the hall. The installation of insulation should be able to be carried out by any reputable building contractor.




### 7.2 Wall Insulation

The walls of the hall are solid concrete panels and it is not possible to add insulation to the walls as they are. There is potential to add insulated render to the external face of the walls but this would be more driven up updating the external appearance of the building and cannot be justified on energy efficiency ground alone. A thermal image inspection of the external walls did not highlight any areas of concern.




### 7.3 Windows and Doors

The building has well sealed uPVC double glazed windows and doors and no further energy saving works are required in this area.

## 8. Other Recommendations

### 8.1 Electric Vehicle Charging Points

The church hall has a car park to the front and rear of it which serves the church hall. In order to make a visible statement on the churches mission of stewardship and to facilitate more sustainable transport choices by those both visiting the church and using the hall, the church may wish to consider installing an electric vehicle charging point, probably on the side of the church hall to allow visitors to charge their electric car.

Installing a unit such as a Rolec Securi-Charge http://www.rolecserv.com/ev-charging/news/view/Robust-EV-Charging-With-Rolecs-SecuriCharge-EV-Wall-Unit-Coin-Token-PAYG would allow the church to be able to sell tokens or have a coin operated device that would at least cover the costs of the electricity use and could make a small income.

## 9. Renewable Energy Potential

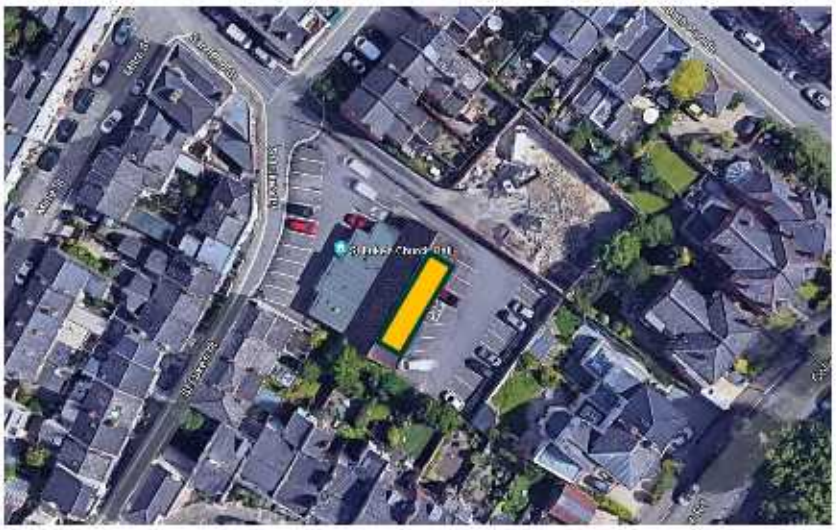
The potential for the generation of renewable energy on site has been reviewed and the viability noted.

| Renewable Energy Type | Viable |
|---|---|
| **Solar PV** | Yes – to rear roof pitch |
| **Battery Storage** | Yes |
| **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 – not cost effective in this location and with nature of existing building and demand. |
| **Air Source Heat Pump** | Yes (see notes above) |
| **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 however, as this hall has extensive use a well sized PV array would have the vast majority of its generated electricity used on site..

There is potential for a small PV array on the rear roof pitch of the hall and an around of around 4kWp should be considered as being viable.

Battery Storage is not strictly a renewable energy solution, but battery storage does however provide a means of storing energy generated from solar PV on site to be able to be used at peak times or later into the day when the PV is no longer generating. It therefore extends the usefulness of the existing PV system particularly in this sort of building. This is a new but fast-growing technology with prices expected to fall substantial over the next 2 to 3 years therefore investment into this may be worth delaying at this stage.



## Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

| Room/Location | Number of Fittings | Recommended Upgrade | Annual Saving (£) | Total Cost (£) | Payback |
|---|---|---|---|---|---|
| **Main Hall** | 10 | 5ft Single Proteus LED | £144.08 | £1,357.90 | 9.42 |
| **Kitchen** | 3 | 5ft Single Vapour LED | £61.28 | £242.67 | 3.96 |
| **Kitchenette** | 1 | 5ft Single Vapour LED | £20.43 | £80.89 | 3.96 |
| **Gents** | 1 | 5ft Single Vapour LED | £26.76 | £80.89 | 3.02 |
| **Small Hall** | 4 | 5ft Single Proteus LED | £57.63 | £509.20 | 8.84 |
| **Attic** | 3 | 5ft Single Vapour LED | £16.48 | £242.67 | 14.72 |