
# Energy Audit Report for
# Dorking St Martin Church

**May 2019**

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## 2 INFORMATION

ESOS Energy conducted an Energy Audit at Dorking St Martin Church in Dorking on 5th May 2019. The audit consisted of a site visit and data analysis during which all church areas were investigated.

This report summarises the audit findings and energy saving opportunities identified during the site visit and subsequent energy data analysis.

The headline messages from the audit are:

- £3,264 investment in energy reduction measures would achieve an estimated annual saving of 20,139 kWh (combined electric and gas)
- Based on today's tariffs, this would result in an annual financial saving of £1,166
- The simple payback period on this investment is 2.8 years

# 3 CHURCH INFORMATION

A site survey was undertaken by Harjit Thind on Monday 5th May 2019. The survey was non-invasive (visual only) and entailed a general walk throughout the church areas including back of house and plant rooms.

**Address:** **Dorking St Martin**
Church Street
Dorking
RH4 1DW

| GENERAL | |
|---|---|
| Listed Status | Grade 2 Listed & Conservation area |
| Building Age | Mainly 1870s with Lady Chapel 1905 & 1913 |
| Area | Approx. 350sqm |
| Usage | Typically 12 hours per week |

# 4 ENERGY DATA ANALYSIS

## 4.1 ENERGY CONSUMPTION:

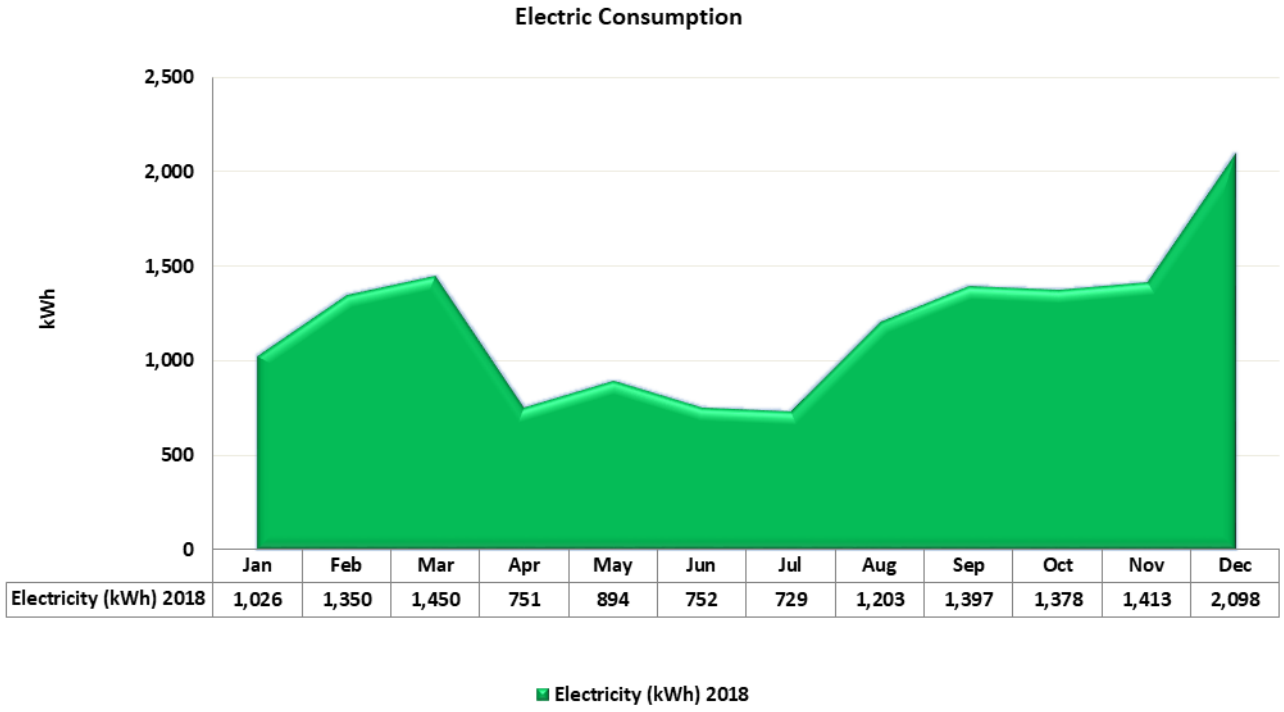
The energy consumption for the church during January to December 2018 is detailed below:

| Utility | Energy Consumption | | Energy Cost | | $CO_2$ Emissions |
|---|---|---|---|---|---|
| | kWh/year | % | £/year | % | $tCO_2$ |
| Electricity | 14,441 | 14.1% | 1,565 | 43% | 8 |
| Gas | 88,152 | 85.9% | 2,036 | 57% | 16 |
| **Total Energy** | **102,593** | **100%** | **3,601** | **100%** | **24** |

*Note: the costs exclude standing charge and VAT.*

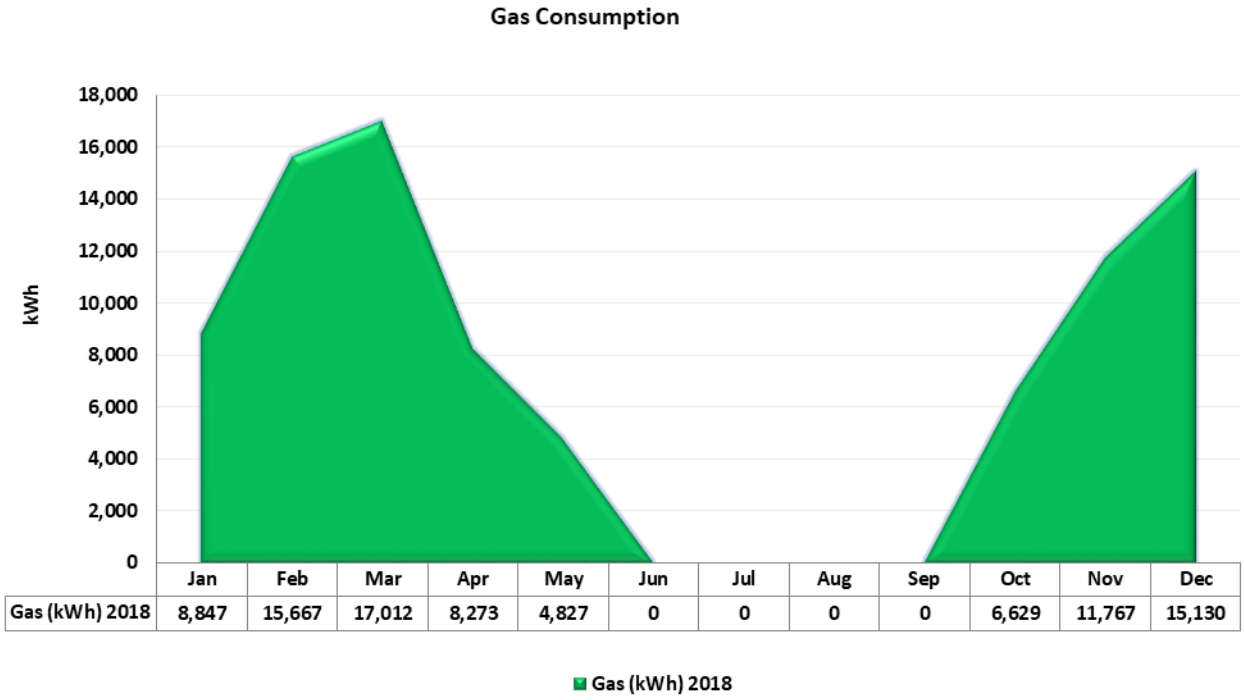
## 4.2 MONTHLY DEMAND PROFILE - ELECTRICITY

The electric consumption profile below shows the annual trend for the period of January 2018 to December 2018. The annual profiles show reasonable consistency throughout the year in-line with typical building usage. Noticeable increase in consumption during the Christmas and Easter period. Electric consumptions is largely from lighting and small power.



## 4.3 MONTHLY DEMAND PROFILE - GAS

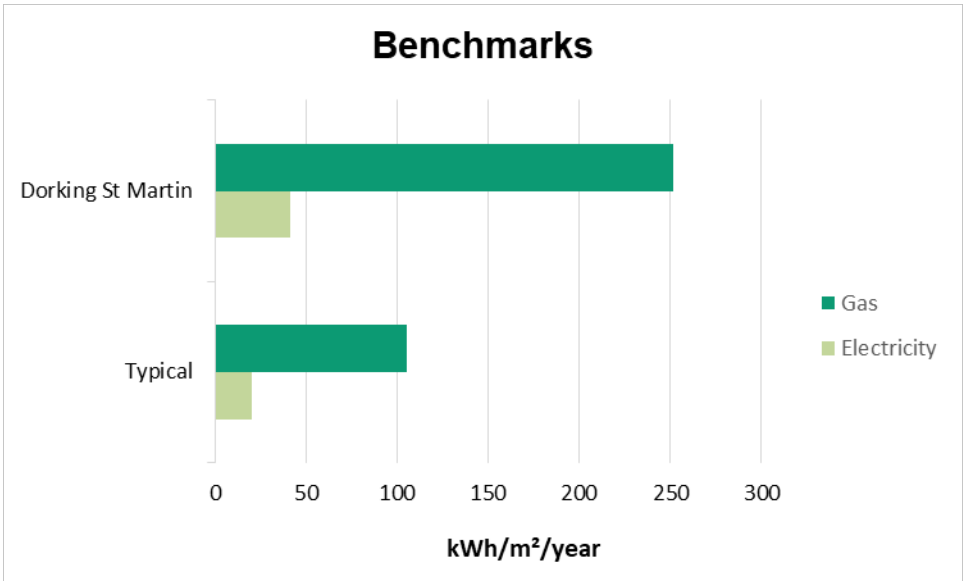
The gas consumption profile below shows the trend during January to December 2018. No consumption during June to September when the heating system is switched off and hot water is from local point of use units.




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas (kWh) 2018 | 8,847 | 15,667 | 17,012 | 8,273 | 4,827 | 0 | 0 | 0 | 0 | 6,629 | 11,767 | 15,130 |

## 4.4 BENCHMARK PERFORMANCE

The use of benchmarks is designed to show how a building is performing in relation to similar buildings with comparable operation. The benchmarking information is broken down on a meter square basis which can be applied to any building size. The graph below depict building energy consumption per square meter compared against CIBSE TM46 Guide 2008 Energy Benchmark guide lines.




The electric consumption is performing worse than the typical benchmark by approximately 106% higher and the gas consumption is performing worse than the typical benchmark by approximately 140% higher.

It should however be noted these are standard industry benchmarks that only provide an objective point of reference. Benchmarks can be higher due higher building use, age and typical heating systems from the typical building stock.

# 5 BUILDING PERFORMACE & OPPORTUNTIES

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 however highlight where further improvements could potentially be made.

## 5.1 BUILDING ENVELOPE

The building envelope is in good repair and no recommendations in this area.

## 5.2 HEATING SYSTEM - BOILERS

Heating is provided by three central gas fired boilers (MHS Regency 2) located in the basement which were installed in 2001 complete with frost thermostat, weather compensator control, external air temperature sensor and indoor air temperature. There is a remote digital programmer installed in the clergy vestry with 7 day program function as detailed below, the times are in-line with current usage and time required for building to heat up sufficiently so no recommendation to change times:

| DAY | CURRENT TIMER |
|---|---|
| Monday | OFF |
| Tuesday | OFF |
| Wednesday | 09:00 – 11:30 |
| Thursday | OFF |
| Friday | 17:30 – 18:50 |
| Saturday | 09:30 – 12:00 |
| Sunday | 06:00 – 11:00 |

The heating system is switched off during June to September which is evident from the gas consumption profiles in section 4.3.

The boilers are 18 years old however in good condition and maintained well. The flue gas analysis shows this is running at approximately 92% efficiency as such no current recommendation to replace boilers. When the boilers reach the end of their serviceable life it is recommended that the boilers are replaced with high efficiency gas condensing boilers.

## 5.3 HEATING SYSTEM – PIPEWORK & DISTRIBUTION

The pipework is generally well lagged in the plant room however some fittings and valves are exposed. It is recommended to install additional lagging to exposed pipe and install valve jackets to reduced heat loss into plant room.

## 5.4 HEATING SYSTEM – HEAT EMITTERS

Heating to the church area is via cast iron radiators of varying sizes across the church floor which are supplied from heating pipes running in floor trenches covered with grilles. It is recommended to install thermal insulation foil below the pipework to reduced heat loss into exposed concrete floor, which can be reflected upwards into the church area.

## 5.5 HOT WATER SYSTEM

No hot water use in the church.

## 5.6 LIGHTING

There is a mix of lighting fittings throughout the church areas as detailed below:

- **Lady Chapel:**
  - Currently hanging chandelier with 25W fluorescent lamps - recommend to replace with 3.5W LED replacements
  - Spotlights with 50W halogen lamps – recommend to replace with 7.5W LED replacements

- **Chancel**:
  - Spotlights with PAR 38 120W fluorescent lamps – recommend to replace with 12.5W LED replacements
  - Spotlights with 50W halogen lamps – recommend to replace with 7.5W LED replacements
  - 300W floodlights - recommend to replace with 60W LED replacements


- **Nave:**
  - Currently hanging chandelier with 25W fluorescent lamps - recommend to replace with 3.5W LED replacements
  - Spotlights with PAR 38 120W fluorescent lamps – recommend to replace with 12.5W LED replacements
  - 300W floodlights - recommend to replace with 60W LED replacements


- **Vestry:**
  - Currently twin fluorescent lamps (T8 58W each) recommend to replace with 22W LED complete unit replacement.

There is no lighting control system, presence detectors or daylight dimming controls. All areas have manual ON/OFF controls.

## 5.7 RENEWABLES

There is currently no renewables on site. Further investigation rules out any potential renewables taking into account usage and grade 2 listed status.

# 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 savings | | | Investment (£) | Simple payback (yrs.) |
|---|---|---|---|---|---|---|---|
| | | | Elec/Gas KWh/yr. | Cost £/yr. | tCO2/yr. | | |
| **Lighting** | 1 | Lady Chapel - replace 25W candle lamps with 3.5W LED replacements | 128 | £14 | 0.1 | £18 | 1.3 |
| **Lighting** | 2 | Lady Chapel - replace 50W halogen lamps with 7.5W LED replacements | 239 | £26 | 0.1 | £126 | 4.9 |
| **Lighting** | 3 | Chancel - replace 120W PAR 38 spotlights with 12.5W LED replacements | 1,207 | £129 | 0.7 | £223 | 1.7 |
| **Lighting** | 4 | Chancel - replace 50W halogen lamps with 7.5W LED replacements | 318 | £34 | 0.2 | £168 | 4.9 |
| **Lighting** | 5 | Chancel - replace 300W floodlights with 60W LED replacements | 1,198 | £128 | 0.6 | £302 | 2.4 |
| **Lighting** | 6 | Nave - replace 25W candle lamps with 3.5W LED replacements | 102 | £11 | 0.1 | £14 | 1.3 |
| **Lighting** | 7 | Nave - replace 120W PAR 38 spotlights with 12.5W LED replacements | 2,415 | £259 | 1.3 | £445 | 1.7 |
| **Lighting** | 8 | Nave - replace 300W floodlights with 60W LED replacements | 2,396 | £257 | 1.3 | £960 | 3.7 |
| **Lighting** | 9 | Vestry - replace all 58W T8 fluorescent lighting to 22W LED replacement unit | 235 | £25 | 0.1 | £148 | 5.9 |
| **Heating** | 10 | Install additional lagging to exposed heating pipes and valve jackets | 3,085 | £74 | 0.6 | £100 | 1.4 |
| **Heating** | 11 | Install Thermal Insulation Foil under heating pipework in trenches | 8,815 | £210 | 1.6 | £760 | 3.6 |
| | | **TOTAL ELECTRICITY SAVINGS** | **8,238** | **£882** | **4** | **£2,404** | **2.7** |
| | | **TOTAL GAS SAVINGS** | **11,901** | **£284** | **2.2** | **£860** | **3.0** |
| | | **GRAND TOTAL** | **20,139** | **£1,166** | **7** | **£3,264** | **2.8** |

# 7 ASSUMPTIONS

## 7.1 ASSUMPTIONS

- The lighting costs excludes labor, installation and access which we estimate will be in the region of £5000+VAT however will require specialist lighting contractor to confirm.
- Average cost of electricity at 10.95 p/kWh
- Average cost of gas at 2.31 p/kWh
- Electricity carbon emission rate of 0.541 kgCO2/kWh
- Natural Gas carbon emission rate of 0.1836 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 & 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 are generating 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.