

# Energy Audit and Survey Report

## St Cosmus & St Damian's Church

PCC of St Cosmus & St Damian, Blean



### Version Control

Author	Reviewer	Date	Version
Paul Hamley	Matt Fulford	3 <sup>rd</sup> December 2019	1.0

---

## Contents

1. Executive Summary .....	3
2. Introduction .....	5
3. Energy Procurement Review .....	6
4. Energy Usage Details .....	7
4.1 Energy Profiling .....	8
4.2 Energy Benchmarking .....	9
5. Energy Saving Recommendations (Electricity) .....	9
5.1 Lighting (fittings) .....	9
5.2 Lighting (control for internal lights).....	10
6. Energy Saving Recommendation (Heating) .....	11
6.1 Heating System and Strategy .....	11
7. Energy Saving Measures (Building Fabric) .....	13
7.1 Draught Proofing to Doors.....	13
7.2 Closed Door Policy.....	13
8. Other Recommendations .....	14
8.1 Electric Vehicle Charging Points.....	14
9. Renewable Energy Potential.....	14
10. Funding Sources.....	15
11. Faculty Requirements.....	15
Appendix 1 – Schedule of Lighting to be Replaced or Upgraded .....	16



## 1. Executive Summary

An energy survey of St Cosmus & St Damian's Church 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 Cosmus & St Damian's Church was constructed in 1233 replacing a previous church; the site has probably been in religious use since Roman times. There was a 16<sup>th</sup> century extension with a large north aisle added in 1866; the pews and pulpit date from this time. The north aisle pews were removed in 2000. Electricity only is supplied to the site.

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 recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Simple Payback (years)	Permission needed	To be actioned by who / when?	£/tonne of CO2
Contact suppliers to arrange for the meters to be changed to smart meters	None	None	Nil	N/A	None	N/A	N/A
Switch electricity (and gas) suppliers to ones which provide 100% renewable (or green gas) supplies	None	None	Nil	N/A	None	N/A	N/A
Replace tube heaters in north aisle with radiant wall panels	10%	£125	£1,000-£1,500	10	Faculty	PCC	

Continue with LED replacement programme	Part of current replacement programme			List A	PCC	
Install draught screen / extra (glass?) doors inside north aisle entrance	5%	£60	£5000 Part of re-ordering	Faculty	PCC	

In addition to the above the church can also consider an electric vehicle charger in its car park.

The Church should check any faculty requirements with the DAC Secretary at the Diocese before commencing any works.

Based on current contract prices paid for electricity.

**If all measures were implemented this would save the church around £200 per year.**

## 2. Introduction

This report is provided to the PCC of St Cosmus & St Damian's Church to provide them with advice and guidance as to how the church can be improved to be more energy efficient. In doing so the church will also become more cost effective to run and seek to improve the levels of comfort. Where future church development and reordering plans are known, the recommendations in this report have been aligned with them.

An energy survey of the St Cosmus & St Damian's Church was completed on the 6<sup>th</sup> November 2019 by Paul Hamley. Paul is an energy auditor with experience of advising churches and small businesses. He is part of the Diocesan Environment Officers Energy Group developing advice for the Church of England and authored the 2018 "Assessing Energy Use in Churches" report for Historic England. He is a CIBSE Associate member and a Chartered Scientist, with experience of the faculty process gained from chairing the building committee of a Grade I listed church.

St Cosmus & St Damian's Church	606044
Gross Internal Floor Area	150 m <sup>2</sup>
Listed Status	Grade II*
Typical Congregation Size	50

The church typically used for 3.5 hours per week for the following activities

Services	2 hours per week
Meetings and Church Groups	0.5 hours per week
Community Use	1 hour per week
Occasional Offices	

The church has an estimated annual use of 200 hours.

Electric heating is provided; assuming no use during May-September; 30 heating weeks. With some preheating it would be in use for an estimated 200 hours.



### 3. Energy Procurement Review

The annual energy use in kWh for electricity together with rates have been supplied by St Cosmus & St Damian's Church and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	16.790p/kWh	Above current market rates
Night Rate	11.760p/kWh	In line with current market rates
Standing Charge	27.00p/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 obtains a quotation for electricity 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 (as is the case at present with the Haven Power contract) and therefore it is an important part of the process of making churches 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.

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



## 4. Energy Usage Details

St Cosmus & St Damian's Church uses 7,170 kWh/year of electricity, costing in the region of £1,250 per year.

The cost data has been taken from one energy invoice provided by the suppliers of the site (for October 2019), which indicates approximately half of the electricity is consumed at day rate charges, 15% at night and 36% at evenings and weekends. These charges have been used to estimate the annual cost.

St Cosmus & St Damian's Church has one electricity meter.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity Church	- S97E01790	Multi-rate watt hour meter	No	South porch electrical cupboard



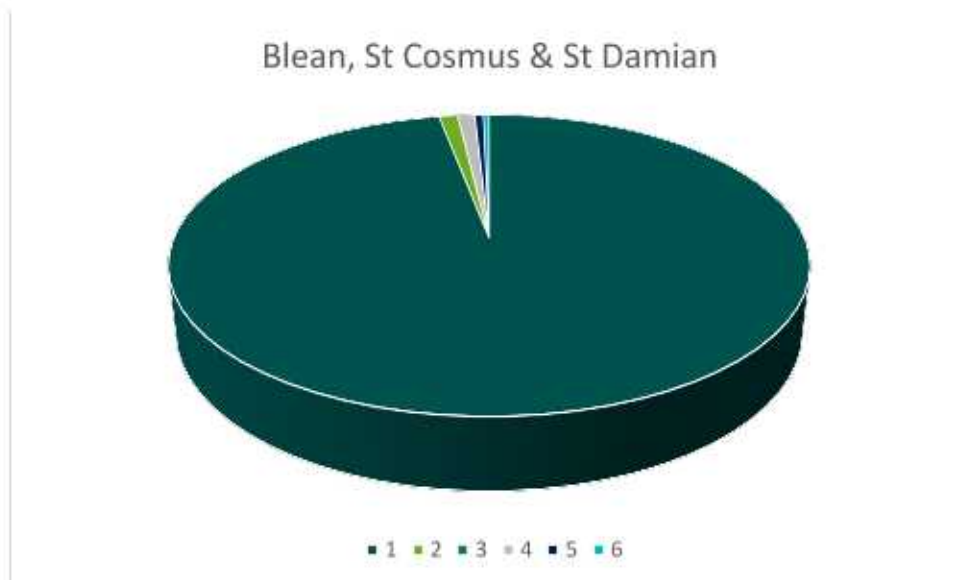
It is recommended that the church consider asking their suppliers to install smart meters so that the usage can be monitored more closely and the patterns of usage reviewed against the times the building is used.



## 4.1 Energy Profiling

Service	Description	Power	Annual Use/ kWh	Estimated Proportion of Usage
Lighting	Downlights (19) x 20W	380W	108	1%
	Uplights (5) x 20W	100W		
	LED chandelier lights (4) x 11W	44W		
	Porch light 15W	15W		
	Streetlamps?	Total		
	200 hours use	539W		
Heating	Electric Under pew heaters 30 x 375W	11.25kW	7000	97%
	Tubular heaters around walls of north aisle Power rating not indicated: estimate 8x3kW	~24 kW		
	200 heating hours	Total 35kW		
Hot Water	Kettle (in hall) 10 boils of 3 minutes/ week x 50 weeks used (NB: kettle uses almost as much as lighting)	3kW	(75)	1%
Other Small Power	Organ (50 hours)	500W	25	1%
	PA System (75 hours)	500W	37	

Total 7,170 kWh



KEY: 1 Heating 2 Lighting 3 External lighting 4 Hot water 5 Small power 6 Organ

As can be seen from this data, the heating makes up by far the largest proportion of the energy usage on site. The other significant load is lighting.





## 4.2 Energy Benchmarking

In comparison to national benchmarks<sup>1</sup> for Church energy use, St Cosmos & St Damian's Church uses considerably less electricity than would be expected for a church of this size.

	Size (m <sup>2</sup> GIA)	St Cosmos & St Damian's Church use kWh/m <sup>2</sup>	Typical Church use kWh/m <sup>2</sup>	Efficient Church Use kWh/m <sup>2</sup>	Variance from Typical
St Cosmos & St Damian's Church (elec)	150	1.3	20	10	7%
St Cosmos & St Damian's Church (heating fuel)	150	46.7	150	80	31%
<b>TOTAL</b>	150	48	170	90	28%

The low values reflect two things – low electricity use is a factor of low hours of use and hence low lighting costs, plus virtually no other major power use.

Secondly, the electric heating is not run for vastly longer hours than the building is in use (as can often be the case with central heating systems which require 8-12 hours to warm up). Thus, the energy used per area is also low. This demonstrates that the heating system and strategy used within this church is highly efficient.

## 5. Energy Saving Recommendations (Electricity)

### 5.1 Lighting (fittings)

The lighting makes up a relatively small overall energy load within the building. The church has a program of gradual replacement of CFL bulbs (often 9-15W, ~5 year lifetime) with LED bulbs (5-10W, 15-20 year lifetime). It is suggested that the complete fitting (not just the lamp) is replaced to ensure compatibility.

<sup>1</sup> CofE Shrinking the Footprint – Energy





It is recommended that all of the fittings, scheduled in Appendix 1, are changed for LED.

### 5.2 Lighting (control for internal lights)



A straightforward labelled system is used. There are no further recommendations to be made in this regard.



## 6. Energy Saving Recommendation (Heating)

### 6.1 Heating System and Strategy

The church currently uses a mixture of recent under pew heaters and electric tube heaters to heat the church. The under pew heaters are reported to work well and provide adequate thermal comfort to the pew area of the church. Given that the system is successful and not overly wasteful of energy we would recommend that this system is continued with.

The under pew heaters can be individually switched if necessary for smaller meetings to create a warm zone without having to turn all of them on. 375W heaters seem to be around the optimum output – reports from elsewhere indicate that 500W delivers too much heat.



The 1.5 inch diameter tube heaters are intended to heat the north aisle, which had the pews removed in 2000. These are very old, possibly 1950s or before and of uncertain output. They heat poorly by convection; most of the heat goes up the walls to the ceiling

Radiant panel heaters could be placed at several locations around the walls, some at low level and some higher. This would allow the aisle area to be heated independently of the nave and pews.

It may not be necessary to run the heating for this area for the whole service, just at the beginning when people are arriving and when people are circulating at the end. This could be experimented with.



An example of suitable electric panel heaters would be far infrared panels such as <https://www.warm4less.com/p/1200-watt-white-panel/>. There is a range of sizes: <https://www.warm4less.com/infrared-heaters/all/>. These can be purchased widely and fitted by any competent electrician.

It is recommended that they are fitted with a time delay switch such as <https://www.danlers.co.uk/time-lag-switches/77-products/time-lag-switches/multi-selectable-time-lag-switch/159-tlsw-ms> so they can not be left on accidentally after use.



## 7. Energy Saving Measures (Building Fabric)

### 7.1 Draught Proofing to Doors

There are two external doors in the building. These should be kept well maintained and as draught proof as possible.

Where a timber door closes against a timber frame it is recommended that draught proofing is fitted. A product called QuattroSeal (see link below) is often used in heritage environments to provide appropriate draught proofing.

[http://www.theenergysavers.co.uk/application/files/1714/7197/4194/National\\_Trust\\_Case\\_Study.pdf](http://www.theenergysavers.co.uk/application/files/1714/7197/4194/National_Trust_Case_Study.pdf). Note this cannot be used where the timber door closes directly against a stone surround.

Other simple measures such as using a small fridge magnet painted black over the large keyhole or the use of 'sausage dog' type draught excluders at the base of little used doors can prove to be very effective. Doors should be reviewed in daylight and gaps where the light shines through sealed or filled in whatever the most appropriate way is for the specific door.

### 7.2 Closed Door Policy

The door into the north aisle appears to be used as the main entrance and exit. Friendly door closers (people!) will be required in cold or windy weather. Mechanical door closure mechanisms (useful for very frequently used doors) are usually slower to close.

The north aisle entrance does not have a porch or draught lobby. It is worth exploring if a draught lobby could be created by adding an extra pair of (possibly glass) doors inside.

This could form part of the re-ordering proposal involving refurbishment and extension of the room mentioned (current vestry?).



Church hall located adjacent to the church building.



## 8. Other Recommendations

### 8.1 Electric Vehicle Charging Points

The church has a car park to the north of the site serving the church and the adjacent hall. Part of this area belongs to the church. 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, visitors to charge their electric car.

Installing a unit such as a Rolec Securi-Charge <http://www.rolecsev.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. As the hall is a place of work for the pre-school users it may be able to benefit from a grant to part cover the installation costs of a charger from <https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers>.

## 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	No – not sufficient demand, visible roof
Battery Storage	No – no viable PV
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 – no radiator system, archaeology in ground
Air Source Heat Pump	No – no radiator system
Blomass	No – not enough heating load

The heating load of around 20kW could be met by a solar PV system, but it is unlikely to get permission as the roof aspect is visible. Also, the relatively small number of hours that the heating system is required for would make it a poor investment with an extremely long payback period.

The church should continue to buy 100% renewable electricity, as it does at present from Haven Power.



## 10. 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>.

## 11. Faculty Requirements

It must be noted that all works intended to be undertaken should be discussed with the diocese DAC.

Throughout this report we have indicated our view on what category of permission may be needed to undertake the work. This is for guidance only and must be checked prior to proceeding as views of different DACs can differ.

Under the new faculty rules;

List A is for more minor work which 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.

List B is for 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.



**Appendix 1 - Schedule of Lighting to be Replaced or Upgraded**

Room/Location	Number of Fittings	Recommended Upgrade
Downlights	19	LED replacement lamp
Uplights	5	LED replacement lamp
Chancel, Chandelier	4 CFL	LED GLS replacement lamp

