ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

All Saints Church, West Dulwich
PCC of All Saints Church

Author	Reviewer	Audit Date	Version
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Contents

1. Executive Summary

An energy survey of All Saints Church, West Dulwich 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.

All Saints Church, West Dulwich consists of a Victorian era structure dating from 1890 whose interior was destroyed by fire in 2000. All the interior and roof dates from the subsequent rebuilding. The entrance foyer facing the main road was added as part of the rebuild in 2006.

There is both gas and electricity supplied to the site.

The church has a number of ways in which it can become 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 (£)	Payback (years)	Permission needed	CO2 saving (tonnes of CO2e/year)
SHORT TERM						
Procure 100% renewable electricity	N/A		Nil		None	
Install presence detector controls for crypt central room ventilation system	12,000	£1,800	£200	<1	List A	2.5
Work with installer of the new Building Management System to understand its use and optimise heating control	5% potentially 20,000	£400	Management time costs	1	None	3.6
MEDIUM TERM						
Relighting Scheme to reduce lighting load	50 to 80% of current lighting load 20,000	£3,000	£60k quoted for full scheme	20	Faculty	4.2
Install point of use water heaters to replace up to five fixed water tanks	5,000	£750	£200 per heater	2	List B	1.1
LONG TERM: 10 years +						
Replace gas boilers with Air to water heat pump system	400,000gas Electric use133,000	Not at present rates	300kW £120k at current costs		Faculty	44
Consider thin sheet solar photovoltaic sheets on south aisle roof	15,000	£2,250	£22,000	10	Faculty	3.1

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

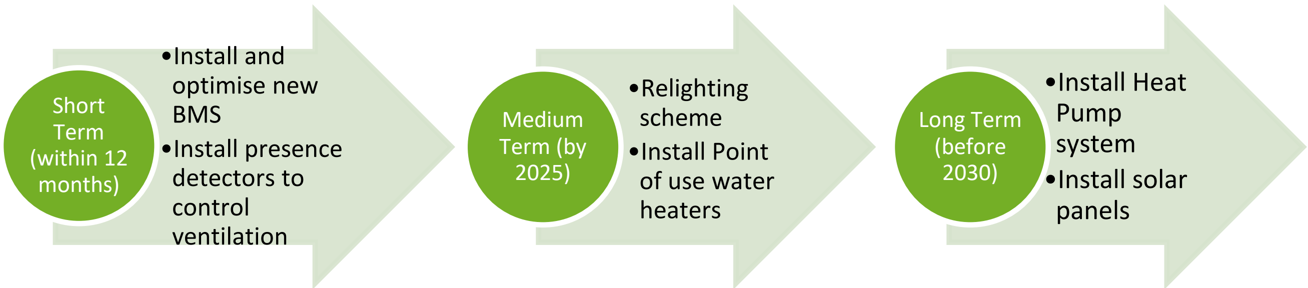
Based on current contracted prices of 15.0672p/kWh (day), 11.7838p/kWh (night) and 1.9079p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church around £8,000 per year in operating costs.

2. The Route to Net Zero Carbon

The General Synod of the Church of England has indicated that the Church of England should be Net Zero Carbon by 2030. Every church, cathedral, church school and vicarage will therefore need to convert to be a net zero building in the next 10 years.

This church has a clear route to become net zero by 2035 by undertaking the following steps:



3. Introduction

This report is provided to the PCC of All Saints Church, West Dulwich to give them 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 with improvements in 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 All Saints Church, West Dulwich, Lovelace Road SE21 8LY was completed on the 31st October 2022 by Dr. Paul Hamley. Paul is an energy auditor with experience of advising churches and small businesses. He is part of the Church Energy Advisors Network developing advice for the Church of England and authored the "Assessing Energy Use in Churches" report for Historic England. He is a CIBSE affiliate member and a Chartered Scientist, with experience of the faculty process gained from chairing the building committee of a Grade I listed church and has been an assessor for Eco Congregation.

The church was represented by Mark Walton, Administrator.

All Saints Church, West Dulwich	CHURCH
Church Code	637084
Gross Internal Floor Area	1,800m^2
Volume	14,400m^3
Heat requirement	400kW
Listed Status	Grade I

The church is typically used for around 34 hours per week, and the crypt for 57 hours per week for the following activities:

Type of Use	**Hours Per Week (Typical)**	**Average Number of Attendees**
Services	7 hours per week	Main service 70
Church Meetings and Groups	9 hours per week	
Community Use	18 hours per week	
Nursery in Crypt	52 hours per week	

4. Energy Procurement Review

Energy bills for gas and electricity have been supplied by All Saints Church, West Dulwich and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	15.0762p/kWh
Night Rate	11.7838p/kWh
Standing Charge	290.5646p/day

Supplier: Total

The current gas rates are:

Single Rate	1.9079p/kWh
Standing Charge	1,045p/day

Supplier: Total

When the current contracts expire, there will be opportunities to gain cost savings from procurement of the energy supplies at this site using a group purchasing scheme.

We would therefore recommend that the church looks into 100% renewable tariffs and obtains quotations for its gas and electricity supplies from group purchasing schemes such as the Big Church Switch scheme and the diocese supported Parish Buying scheme, http://www.parishbuying.org.uk/energy-basket or similar such as the Charity Buying Group.

These scheme offers 100% renewable electricity and a proportion of renewable gas and therefore are 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% on gas / 20% on electricity	The organisation is understood to be a charity and therefore should be benefiting from only be charged a 5% VAT rate. A VAT declaration should be sent to the supplier to adjust this.

CCL	100% charged	As the organisation is being charged the wrong VAT rate they are also being charged CCL which should not be applied as they are a charitable organisation. Sending the supplier a VAT declaration will remove this charge.

Whenever monthly electricity consumption exceeds 1,000kWh, or gas consumption exceeds 4,397kWh (52,000kWh per annum), 20% VAT is charged unless the customer has submitted a VAT declaration form.   This should always be done when changing supplier.

The church is a charity and therefore can claim VAT exemption status.

Excess VAT paid can be reclaimed for the past three years.

VAT declarations are available from the suppliers website and can usually be found by typing the suppliers name followed by “VAT Declaration Certificate” into most website search engines.

A detailed explanation is available here: https:// perfect-clarity.com/vat-on-church-utility-bills/#:~:text=There%20is%20no%20VAT%20chargeable%20on%20Church%20water%20bills

5. Energy Usage Details

5.1 Annual Consumption

All Saints Church, West Dulwich used 113,954kWh/year of electricity from 1st March 2019 to 28th February 2020, costing £20,824 for the year.   This was divided 82% day / 18% night.

Gas use for the church was 399,771kWh from 1st March 2019 to 28th February 2020, costing £13,017 for the year.   Both figures reflect heavy use by the nursery on site.

This data has been taken from monthly electricity and gas bills provided by the church.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity - Church	215122617	EDMI Atlas Mk10A	Yes	Boiler room
Gas – Church	M040 K02541	Elster Bk-G25M	Yes	Boiler room entry area

All the meters are AMR connected and as such an annual energy use profile for the site could be obtained from the supplier.

5.2 Energy Profiling

The main energy consuming plant can be summarised as follows:

	Equipment	Power kW	Annual Consumption kWh	Portion
Heating [Gas]	3 x ELCO condensing boilers Installed 2019. Each 102kW input, 95kW output [1,330 hours use] Gas hobs in two kitchens	307 2 x 12	TOTAL 400,000	81%
Heating & Ventilation [Electric]	Boiler circulation pumps Tumble dryer, regular nursery use Toilet hand dryers Trace heating cable warming boiler water tank to nursery supply pipe Crypt Main Hall 4 x ventilation fan cabinets, run constantly	1 3 2 1 2	2,000 3,000 2,000 3,000 17,000 TOTAL 27,000	5.50%
Lighting [Internal]	CHURCH 1750 hours use > 100 lamps, many 100W Dimmer controls add an unknown amount. CRYPT 3000 hours use 100 lamps, many LED, 30W average	10kW 1kW 3kW	17,000 8,000 9,000 TOTAL 34,000	6.9%
Lighting [External]	LED lighting with presence detectors	100W	100	0.02%
Hot Water	2 x Heatrae Sadia Megaflo 300 litre tanks (boiler room and crypt main kitchen). Immersion heated in summer. Fixed water heater, 20L, Nave Kitchen Sunday use only Fixed water heater, 20L, storage cupboard Fixed water heater, 20L, Community room (Zip aquapoint). Occasional use	5.7 each 3 3 3	12,000 500 500 500	

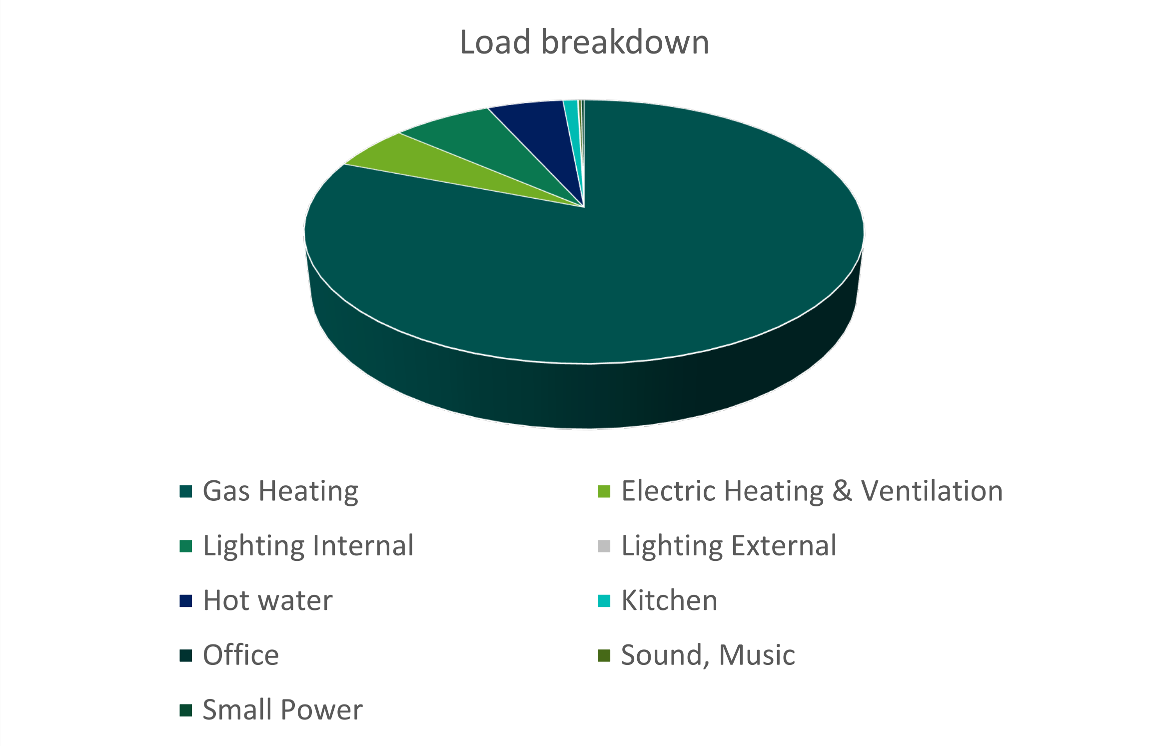
	Kettles Urn Dishwasher, commercial short cycle, main crypt kitchen used 3 x per week Dishwasher, domestic (nave rear, weekly use) Dishwasher, domestic (nursery, daily use) 3 washing machines, regular nursery use	3 each 2 5 3 3	1,000 500 500 500 2,000 8,000 TOTAL 26,000	5.3%
Kitchen Equipment	Fridges 2 large 4 small Microwave ovens (3) Extraction vents	 0.4 0.6 1 x 3	 3,000 1,000 1,000	1.0%
Office	1 workstation, 20 hours/week Photocopier	200W 500W	200 50	0.05%
Sound, Music	Sound system, music Organ	0.5 0.5	750 250	0.2%
Small Power	Vacuum cleaner 3 hours/ week Various small power supplies	1.5	200 800	0.2%

Sum of estimates: 94,000kWh

Annual site electricity consumption, 20xx: 114,000kWh

The shortfall is due to certain items which may have a very high use. This may be the lighting – higher hours of use or more high rated lamps than estimated, the lighting dimmer controls, very high hot water use through summer when the tanks are heated by immersion heaters, or more powerful fans in the crypt hall, which is ventilated constantly at present. It is worthwhile the church investigating further, using this list as a starting point to identify areas for savings.

If the new Building Management System is interfaced with heating, lighting and ventilation it should be able to track use.



As can been seen from this data, the heating makes up by far the largest proportion of the energy usage on site. The other significant loads arise from ventilation, lighting and hot water.

5.3 Energy Benchmarking

In comparison to national benchmarks for church energy use All Saints Church, West Dulwich uses 2.3 times the amount of electricity and 40% more heating energy than is average for a church of this size.

	Size (m² GIA)	Annual Energy Usage (kWh)	Actual kWh/m²	Benchmark kWh/m²	Variance from Benchmark
All Saints Church, West Dulwich (elec)	1,800	114,000	63	27	+234%
All Saints Church, West Dulwich (gas)	1,800	400,000	222	156	+40%
TOTAL	**1,800**			**183**	**+71%**

There is currently no benchmark data available which takes hours of use and footfall into account.

[1] CofE Shrinking the Footprint – Energy Audit 2013.

6. Efficient / Low Carbon Heating Strategy

6.1 Reducing Environmental Impact

The energy used for heating a church typically makes up around 80% to 90% of the overall energy consumption. Heating also often uses gas or oil as its primary fuel, these are fossil fuels with high carbon emissions and little opportunity to decarbonise in the future. Electricity currently has carbon emissions of around the same level as mains gas but the carbon emissions associated with electricity are reducing rapidly as the UK builds more renewable energy and decommissions its remaining coal fired power stations. Mains gas does have some potential to reduce its carbon content through the use of bio gas and hydrogen but these are less developed solutions and will be unable to deliver 'zero carbon mains gas'.

Whilst there are plans to add hydrogen to the network, and "green" gas from anaerobic digestion; some suppliers offering up to 20% "green gas" tariffs, the majority of the gas supply will continue to be fossil fuel for the next decade. The economics of hydrogen production and the need to replace some pipework make full decarbonisation of gas unlikely.

It is therefore important to review and plan to increase building efficiency and become less carbon intensive. One way to achieve this is to consider a transition to electrical heating where this also represents a more efficient and comfortable solution for churches.

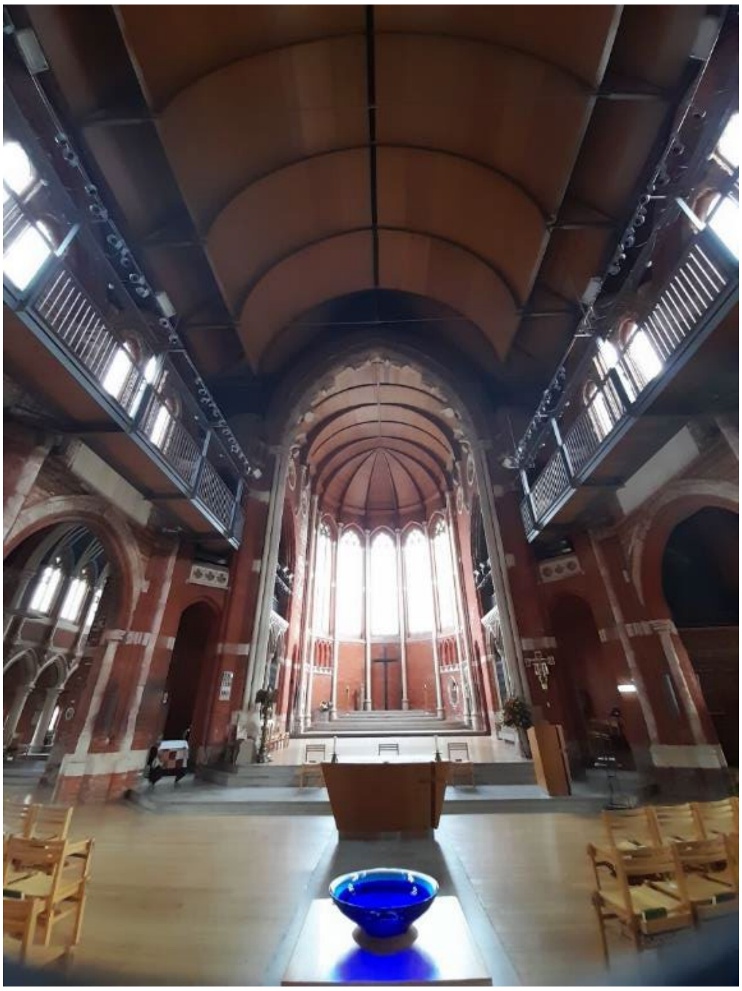
The church should develop a boiler replacement plan for the long term, by obtaining detailed quotations for the options presented in this report. Where electric heating can be obtained at similar or lower operating cost, this is recommended.

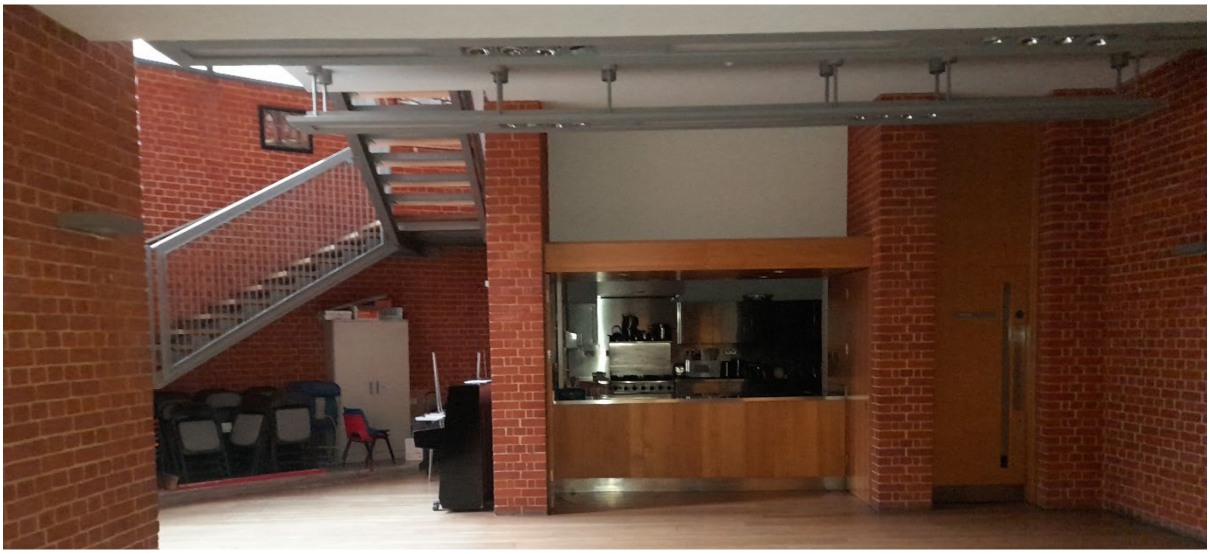
6.2 Building Use and Overview

All Saint's church is a large building on multiple levels. It is entered through a modern (2006) foyer which contains the church office and the main kitchen on the basement / crypt level.

Above the aisles are walkways leading to meeting rooms and the choir balcony. The crypt contains a central main hall (used by the nursery during the day) which is surrounded by other rooms, kitchens, offices and laundry used by the nursery. There are six kitchens / kitchenettes in total (nave rear, main, nursery main, baby room, staff room, small kitchenette). The nursery is in use throughout the working week.

A large amount of lighting is installed. Some of this has recently been changed to LED, whereas other fittings are reported as being difficult to source the correct LED lamps.





Above, main kitchen in the crypt.   Below; crypt main hall

6.3 Site Heat Demand

The Centre for Sustainable Energy model[2] can be used to estimate heat load for the building.

Heat Load (kW) = Volume V (m^3) x Insulation Factor

<u>Insulation Factors</u>

Poorly insulated with open or broken windows, draughty doors (add 5%)	0.034
Poorly insulated (assume no interventions)	0.033
Some insulating features	Estimate value
Well insulated	0.022
Insulated to 2010 regulations	0.013

Area	Volume m^3	Insulation Factor kW/m^3	Heat Required (Space heating) kW
Nave and upper areas	9.500	0.03	285
Entrance building	1,600	0.013	21
Crypt	3,000	0.028	84

2 www.cse.org.uk/local-energy/download/estimating-the-heat-demand-of-a-hypothetical-community-building-79

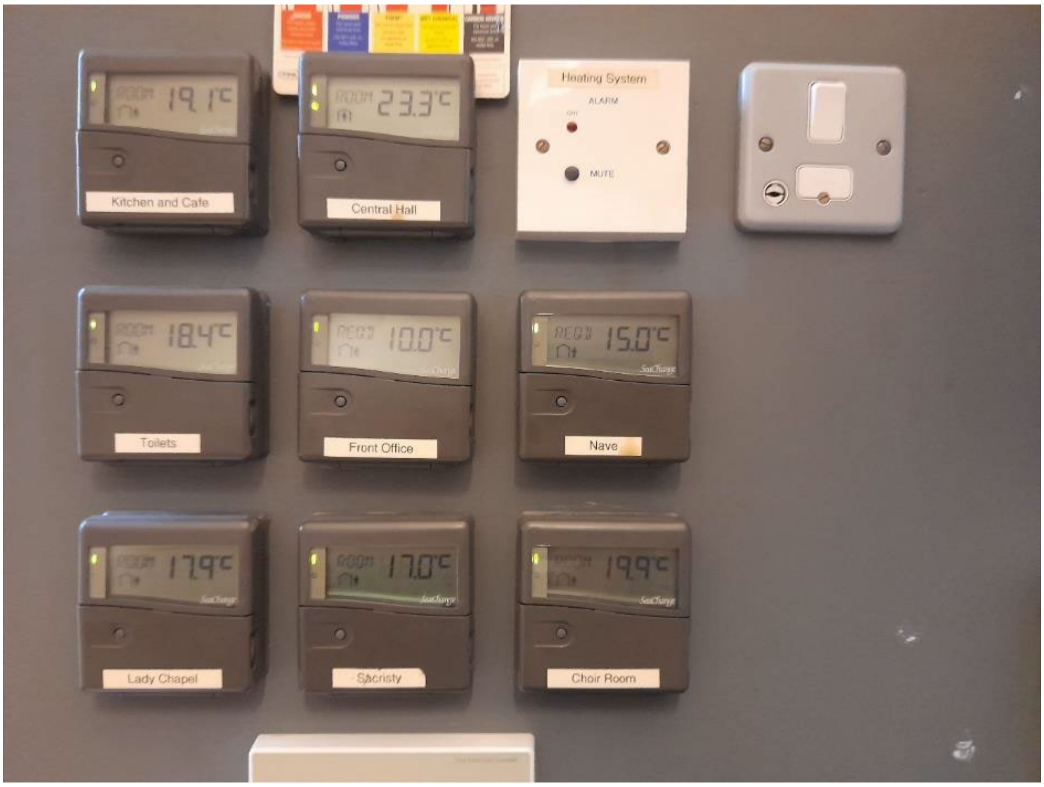
7. Improve the Existing Heating System

Three Elco combination condensing boilers of 102kW input each are fitted, installed in 2019. These give a combined output of 285kW. These also heat the boiler room hot water tank which supplies the end of the crypt used by the nursery during the heating season.

In the years before the replacement of the existing heating system it is recommended that measures are taken to improve the efficiency of the existing heating system, this should include:

7.1 Building Management System

The current Seachange BMS is reported to be inoperative. The installer is out of business. A new BMS is to be installed shortly.



It is strongly recommended that the installer adequately briefs the Operations Manager, wardens and technically competent members of the congregation in its operation and that the church work with the installer to ensure that control of heating and ventilation is optimised.

This should include return visits during the winter to check operation during cold periods such as mid-January.

If the new system is able to display energy use over time, and cumulative energy use, this data can be used to identify savings; i.e. when things are turned on but the building is empty or in light use.

The pace of change of technology as well as movement of people means that managing complex technology needs to be very carefully considered and managed.

7.2 Crypt Main Hall Ventilation Control

The crypt hall is located within the centre of the basement with other rooms surrounding it on each side, it has no external walls. It is fitted with four heating and ventilation cabinets.

Currently, the ventilation fans are operating constantly.

It is strongly recommended that they be controlled via PIR presence detectors which therefore only operate the fans when the room is in use. If background ventilation is required for any building fabric purposes this may be able to be achieved my significantly reducing the fan speed or number of fans operating when not in occupation.

8. Future Heating Options

8.1 Options Overview

The church is currently seated using moveable chairs and heated with an underfloor heating system in the nave and aisles, with pressed steel radiators in the auxiliary rooms.

The recently installed (2019) condensing boilers replaced plant which was new in 2006. A further replacement should be envisaged for 2032. By this time, heat pump technology is expected to have advanced in efficiency and availability and dropped in price relative to gas boilers.

The church is not surrounded by any land except for pathways. There is some land in the adjacent vicarage garden so giving the potential for Ground Source Heat Pump with boreholes, although the capital expense may preclude this. The current plant room is on the appropriate side of the building to connect with boreholes on this side.

Air to Water heat pumps would require an external location for plant. Given the location of the building with the pathways on the south side partially recessed into the hillside, a location on the church path / vicarage garden boundary may be appropriate (i.e. not directly against the church building itself). Again, this would be on the same side as the plant room. Heat pumps supplying warm water at 45 to 50ºC are ideally suited to underfloor heating systems where semi constant supply of warm water is required.

8.2 Heat Pumps: delivering more kWh of heat than electricity used

The efficiency advantages of heat pumps mean that in some circumstances they can work out at equivalent or cheaper operating cost than gas despite the higher cost of electricity per kWh. This effect is increased if electricity is generated on site by solar power.

Electrically operated heat pumps can provide between 2.5 times and 5 times the amount of heat in kW which they consume in electricity (This is termed the Coefficient of Performance, CoP). They are compatible with underfloor heating, which typically runs at fairly low water temperatures, but not with high temperature heating systems. When replacing gas boilers directly, sometimes larger radiators are required, or fan assisted radiators, or running the system for longer periods to achieve the same temperature (but at less power input).

Refrigeration technology is mature and reliable; the units appear to offer lower maintenance costs compared to gas boilers.

Heat pumps generally deliver water at around 45 to 50ºC (although there are higher temperature ones on the market which require more energy to run); thus are compatible with a building which is regularly used and can be supplied with constant, medium heat, rather than a full power heat up on Sunday mornings.

Air-to-water source systems deliver between 2.5 and 3 times the amount of heat in kWh to water that they consume.

Ground source systems are more efficient (since the average ground temperature is higher than the average air temperature), but require either a borehole, or extensive trench digging.

Where a site has a daily requirement for heat (and thus high daily expenditure), the lower operating costs of a ground source pump outweigh the higher capital costs.

Some of the extra electricity required to run heat pumps can be obtained from solar PV panels. Some types of heat pump can provide cooling – solar powered cooling in summer is very efficient. The small available area of the south aisle roof means that the majority of electricity will still be required from the grid.

8.3 Ground Source Heat Pump Option

If the heating power is the same as the current boiler, a 285kW output Ground Source Heat Pump operating at CoP 3.5 requires 81kW of electricity.

Capital cost (2019 data, £1,000 per kW output) £285,000

Current costs per hour for gas (assumes boiler operates at full power, which it will when warming the building from cold). Boilers total 307kW input.

Gas boiler costs 307 kW x 1.9079p/kWh = 586p/hour

GSHP costs 81kW x 15p/kWh = 1,215p/hour

With the current very low gas tariff, boiler operation is clearly cheaper. As prices evolve, the ratio will change.

8.4 Air to Water Heat Pump Option

If the heating power is the same as the current boiler, a 285kW output Ground Source Heat Pump operating at CoP 2.5 requires 114kW of electricity.

Capital cost (2019 data, £400 per KW output) £114,000

Gas boiler costs 307 kW x 1.9079p/kWh = 586p/hour

ASHP costs 114kW x 15p/kWh = 1,710p/hour

With the current very low gas tariff, boiler operation is clearly cheaper. As prices evolve, the ratio will change.

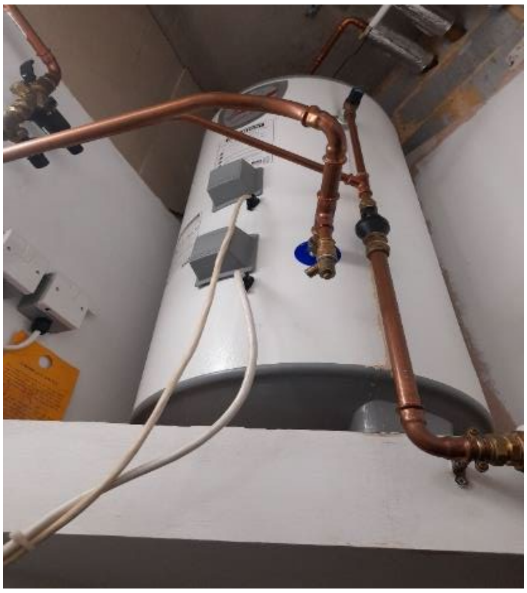
9. Energy Saving Recommendations - Equipment

In addition to having a revised heating strategy there are also a number of other measures that can be taken to reduce the amount of energy used within the church.

9.1 Fixed Water Heaters: Timer Control

Five water heater tanks were located. Three of these are small (15 to 20 litre) items, used sporadically:

- In the nave rear kitchenette, used once per week and normally turned off
- In the community room, used sporadically and normally turned off
- In the cupboard, unknown use



There are two Heatrae Sadia Megaflow 300litre tanks.

- Adjacent to the crypt (main) kitchen which serves it (above, right).

If this kitchen is the only user of this hot water, it appears oversized for the reported low kitchen use (weekly?). Standing losses from a large tank which must keep water above the temperature required by legionella legislation, together with and uninsulated pipes cost around £200 annually. It is recommended that this large tank is replaced by a point of use instantaneous water heater to serve the kitchen.

- Boiler room located, understood to supply hot water to the nursery.

The nursery has four kitchen areas supplied with hot water– main food preparation area, baby room, staff room and a further small kitchenette / sink area.

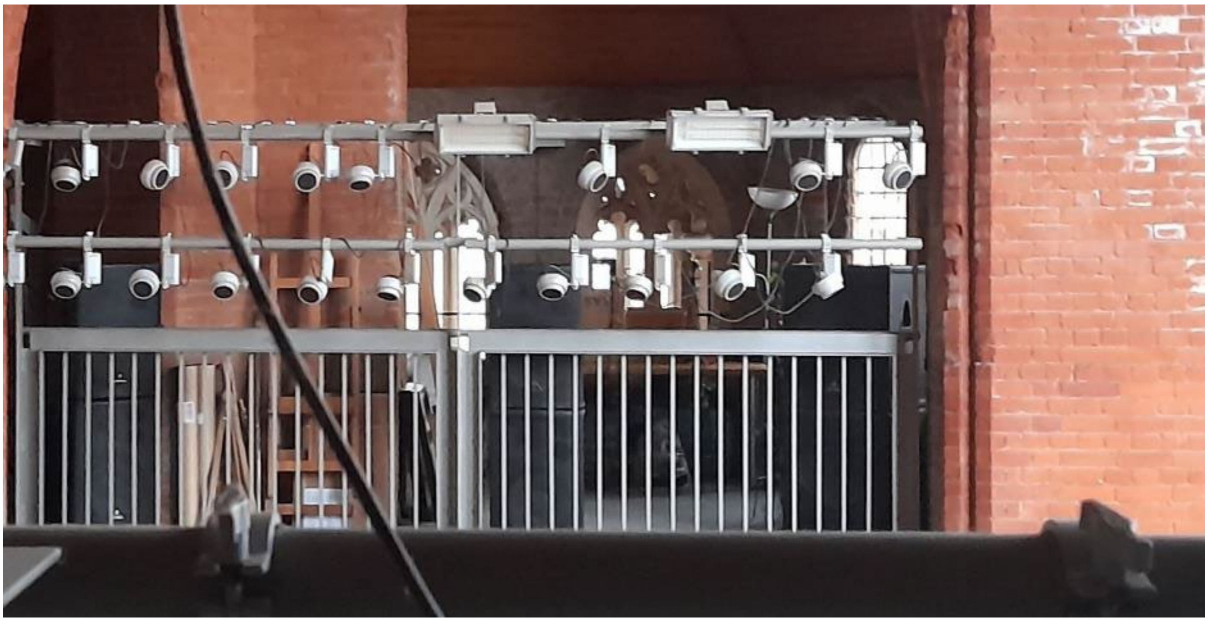
This 300 litre tank has its output pipe fitted with an electric trace heater (red cable, above). This indicates that there is a long piping run from the tank to the taps served and the need to provide extra heat to keep the water hot and comply with legionella regulations. The tank will be run from the gas boiler heating circuit during the heating system, and from electric immersion heaters otherwise.

The combination of standing losses from the tank itself but particularly the electric trace heating of the pipe means that installing several instantaneous point of use heaters on the various taps may be cost effective. Note that with no stored hot water from these devices, there is no legionella risk to manage. Electric point of use units only have to be set to 50°C in accordance with HSE requirements.

It is recommended that this large tank is replaced by a number of point of use instantaneous water heaters to serve the nursery hot water outlets.

9.2 New LED Lighting

The lighting makes up a relatively large overall energy proportion of the electricity used within the church, and large areas are lit by relatively inefficient halogen fittings within the body of the church. A large number of lamps are affixed to lighting gantries along the nave. These, dating from 2016, are halogen lamps and reported as not having a straightforward LED replacement.



Some of the downlights installed in the suspended plinths running along the aisles and areas in the crypt have been replaced by LED.

CES Ltd have submitted a relighting quote of around £60,000.

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. The existing lamps appear to be AR111 lamps and there are LED versions of these available but care would have to be taken to ensure that whatever replacement lamp is used is compatible with the dimmer rack, see Philips-low-voltage-consumer-led-lamps-transformer-dimmer-compatibility(20220620) (signify.com) for a compatibility list. Alternatively new LED fittings could be clipped into the existing track and modifications made to the dimmer racks.

Above, dimmer controls for lighting.

9.3 Lighting Controls (Internal)

Lights in areas of the crypt which are currently switch operated could be controlled by PIR presence detectors. Some of these areas are only used occasionally and for a short amount of time and as such, the light does not need to remain on constantly.

It is recommended that a motion sensor is installed on these specific lighting circuits so that the lights come on only when movement is detected in the space and turn off approximately two to five minutes after the last movement has been detected (note that the duration of the time lag after which the light goes off needs to be consider alongside the type of light that is fitted. LED lights are much more suited to being switched off after only a short duration than some fluorescent lights). These movement sensors (commonly called PIRs) also have light sensors integrated into them so they can be used to make sure that the light does not come on if there is already sufficient daylight in the space.

Your existing electrician or any NICEIC registered electrical contractor can install PIR sensors onto existing lighting circuits. This can be carried out without significant disruption to the use of the space.

10. Energy Saving Recommendations – Building Fabric

10.1 Draught Proof External Doors

Doors are a mixture of 2006 installed wood against wood frames in the older part of the building and metal framed glass doors in the contemporary entrance area.

The wood doors have some gaps around their lower portions. It is recommended that the draughtproofing around the door is improved and appropriate draught strips are added.

Simple measures such as having a 'sausage dog' style draught excluder laid along the base of a door are possible.

11. Saving Recommendations (Water)

11.1 Tap Flow Regulators

Over provision of water for hand washing is not only a source of excessive water use, but in the case of hot water, it is also a source of wasted energy in the heating that has to go into providing the hot water.

The flow rate of the taps can be easily regulated by fitting flow regulators within the taps. It is recommended that flow regulators such as those manufactured by neoperl (http://www.neoperl.net/en/) are fitted into all the viable hand wash basin taps to save on both water and heating of the hot water.

These regulators can be self-installed or by any good facilities staff.

11.3 Laundry

It is recommended that the lowest temperature (30°C) wash cycles are used when possible.

Any items requiring a higher temperature wash should be put together into one load.

12. 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
Battery Storage	Future potential
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Biomass	No – not enough heating load as well as air quality issues
Air Source Heat Pump	Yes
Ground Source Heat Pump	Yes
Air to Air Source Heat Pump	Incompatible with underfloor system

12.1 Solar Photovoltaic Panels

Most of the roof of this grade I listed building is visible from the ground. Traditional glass faced panels would be highly visible. The roof appears to be covered in metal sheeting, thus a new type of solar panel, developed for attachment to metal sheet roofing may be applicable.

A UK manufacturer offering this type of technology is the Building Integrated Photovoltaic co. https://bipvco.com

The lower section of the roof offers an area of up to 100m^2. This could generate 0.15kWpeak/m^2 giving a 15kWpeak system. A 1kWpeak system can generate up to 1000kWh annually.

The following formula calculates annual generation.

Annual Generation (kWh) = Area x 0.15kWp/m^2 x 1000kWh/kWp x Orientation Factor x Overshading Factor.

Roof Section	Useable area / m^2	System Size / kW peak	Orientation factor	Shading factor	Annual Generation, kWh
Nave	100	15	180 degrees / 40^0 0.99	0.8	11,880

This is the maximum likely figure, which may be reduced by factors such as the weight of panels (due to roof strength) and access space between panels. The ability of the roof structures to support the extra loads should be discussed with the church's inspecting architect.

The system should be specified for future addition of a battery, when battery costs reduce as this would extend system usefulness into the evening.

Battery Storage is not strictly a renewable energy solution but provides 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. This is a new but fast-growing technology.

Using average 2019 installation costs (£1,450 per kWpeak); a 15 kWpeak system would cost £21,750.

13. Funding Sources

There are a variety of charitable grants for churches undertaking works and a comprehensive list of available grants is available at www.parishresources.org.uk/resources-for-treasurers/funding/

This includes a 77 page guide to funders and their criteria:

https://www.parishresources.org.uk/wp-content/uploads/Charitable-Grants-for-Churches-Jan-2020.pdf .

14. Faculty Requirements

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

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 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.