ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

St Peter's Church
PCC of St Peter's

THE DIOCESE OF BLACKBURN
THE CHURCH OF ENGLAND IN LANCASHIRE

Author	Reviewer	Date	Version
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1. Executive Summary

An energy survey of St Peter's Church was undertaken by ESOS Energy 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 Peter's Church dates back to 1829, with amendments made to the church in 1979 with the changes to the narthex and parish office. The church is heated from gas boilers to perimeter radiators. The hot water is provided by electric point of use water heaters. The lighting in the church is currently mainly fluorescent lamps, but due to be replaced with LEDs in September 2021. There is both gas and electricity 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 and the route to net zero carbon are 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)
Optimise control system settings / disconitnue background heating	9,204	£334	£0	0.00	List A (None)	1.70
Install SavaWatt devices on fridges and freezers	140	£24	£50	2.05	List A (None)	0.04
Fit timed fused spurs to hot water heaters	486	£84	£270	3.20	List A (None)	0.12
Change existing lighting for low energy lamps/fittings	4,207	£731	£3,694	5.05	Faculty	1.07
Insulate exposed pipework and fittings in plantrooms	3,068	£111	£600	5.39	List A (None)	0.57
Replace windows	9,204	£334	£3,400	10.18	Faculty	1.70
Install a Solar PV array to roof of building (assumed 100% of energy generated used in building)	10,791	£1,876	£21,583	11.51	Faculty	2.73

Install reflective panels behind radiators	1,227	£45	£520	11.68	List B	0.23
Install PIR motion sensors on selected lighting circuits	99	£17	£268	15.66	List B	0.02
Install thermostatic radiator valves (TRVs)	3,682	£134	£2,860	21.41	List A (None)	0.68
Replace heating system for electrical based heating solution	-31,330	-£13,883	£105,979	-7.63	Faculty	-12.14
Install an Air Source Heat Pump into the building to replace existing heating system at end of life	42,953	-£973	£60,800	-62.51	Faculty	6.66

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

Based on current contracted prices of 17.38p/kWh and 3.63p/kWh for electricity and mains gas respectively.

Excluding the switch to electric heating, if all other measures were implemented this would save the church £3,690 per year and reduce its carbon footprint by 8.85 tonnes (63%).

2. The Route to Net Zero Carbon

Our Government has committed to move towards Net Zero Carbon – the point at which we have reduced emissions as much as we can and then balanced any residual emissions through removal of carbon from the atmosphere. They have done this as part of a worldwide agreement which aims to limit global warming to well under 2 degrees Celsius, with an aim of keeping it below 1.5 degrees Celsius. This will help protect all of us from the impacts of climate change.

In February 2020, the Church of England's General Synod set its own Net Zero Carbon target. The first stage of this target covers energy used by churches, cathedrals, schools, vicarages, other church buildings, as well as emissions caused by reimbursed transport. The target date is 2030.

This church has a clear route to become net zero by 2030 by undertaking the following steps:

3. Introduction

This report is provided to the PCC of St Peter's Church 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 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 Peter's Church, Bank Street, Darwen BB3 3HE was completed on the 23rd March 2021 David Legge. David is an experienced energy auditor with over 10 years' experience in sustainability and energy matters in the built environment. David is a fully qualified ESOS lead assessor with CIBSE and a CIBSE Low Carbon Consultant and a fully qualified ISO50001 lead auditor.

St Peter's Church	
Church Code	603102
Gross Internal Floor Area	735 m^2
Listed Status	Grade II*

The church typically used for 13 hours per week for the following activities

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Services	4 hours per week	116
Occasional services (weddings, funerals, etc)	1 hour per week	
Other	8 hours per week	

There is additional usage over and above these times for festivals, concerts and the like.

4. Energy Procurement Review

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

The current electricity rates are:

Blended Rate	16.07p/kWh	In line with current market rates
Standing Charge	22.7p/day	N/A

The current gas rates are:

Single	3.63p/kWh	In line with current market rates
Standing Charge	170p/day	N/A

The above review has highlighted that the current rates being paid are in line or below current market levels and the organisation can be confident it is receiving good rates and should continue with their current procurement practices.

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	100% not charged	The correct CCL rate is being applied.

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

5. Energy Usage Details

St Peter's Church uses 10,702kWh/year of electricity, costing in the region of £ £1,860 per year, and 61,361 kWh/year of gas, costing £2,226. The total carbon emissions associated with this energy use are 14.03 CO_2e tonnes/year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. St Peter's Church has one main electricity meter, serial number 219031789. There is one gas meter serving the site, serial number E025K02354 17D6.

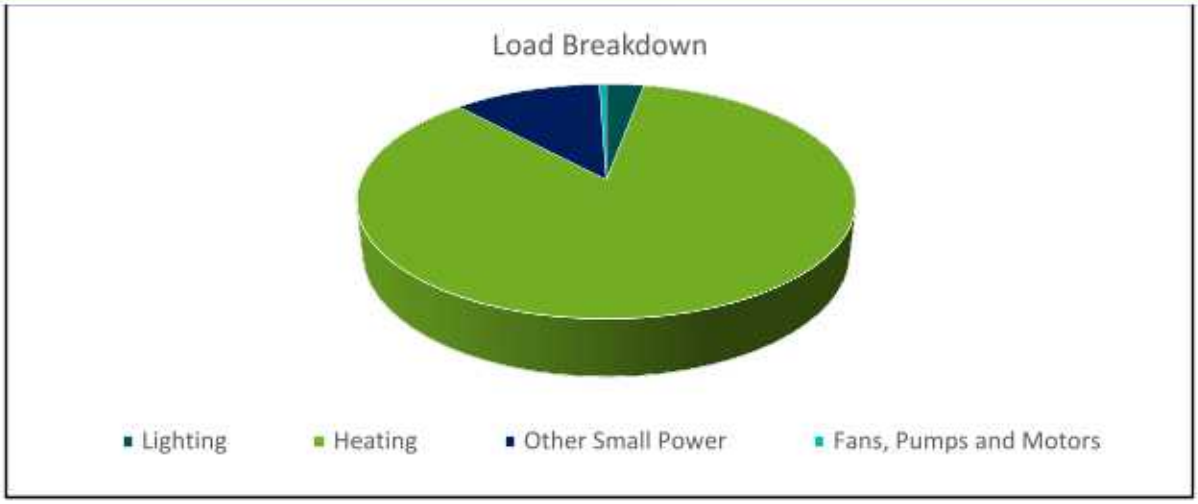
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	219031789	EDMI Atlas Mk 10D	Yes, no AMR connected	North meter cupboard
Gas – Church	E025K02354 17D6	Elster BK G16E	Full AMR Connected	Boiler room

It is recommended that the church consider asking their suppliers to install smart meters, where not already fitted, so that the usage can be monitored more closely, and the patterns of usage reviewed against the times the building is used.

5.1 Energy Profiling

The main energy consuming plant can be summarised as follows:

Service	Description	Estimated Proportion of Usage
Lighting	All church lighting scheduled to be replaced with LED in Sept 2021. Ancillary areas and parish centre are remaining as predominantly fluorescent lighting.	3%
Heating	Provided by 4no. gas fired condensing boilers to fan convector heaters and perimeter radiators throughout.	85%
Other Small Power	Sound system, organ, CCTV, kitchen appliances and other plug-in loads.	11%
Fans, Pumps and Motors	Heating pumps.	1%



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 load is other small power.

5.2 Energy Benchmarking

In comparison to national benchmarks for church energy use St Peter's Church uses 27% less electricity and 44% less heating energy than would be expected for a church of this size.

	Size (m^2 GIA)	Annual Energy Usage (kWh)	Actual kWh/m^2	Benchmark kWh/m^2	Variance from Benchmark
St Peter's Church (elec)	735	10,702	14.56	20.00	-27%
St Peter's Church (gas)	735	61,361	83.48	150.00	-44%
TOTAL	735	72,063	98.04	170.00	-42%

6. Efficient / Low Carbon Heating Strategy

The energy used for heating a church typically makes up around 80% to 90% of the overall energy consumption. Putting in place a heating strategy that is energy efficient and low carbon is, therefore, of the highest priority

The Church of England is in the process of reviewing its heating guidelines. The process has already established some principles for heating that can help churches as they seek an acceptable combination of comfort, conservation, affordability, and environmental care. The principles can be found at https://www.churchofengland.org/sites/default/files/2020-04/CBC%20Heating%20guidance%20principles%20FINAL%20issued.pdf

As the principles make clear, every church's strategy will be unique to it, informed by many factors, including the nature of its usage, the system it's starting from, the conservation needs of the building, and the resources available. The strategies in this audit are designed specifically for your church.

Our recommendations on heating generally fall within three major areas. Firstly, for all churches we make recommendations that will help to reduce energy wastage and, as a starting point, to optimise the system that you already have

Secondly, we recommend options for many churches that focus on heating people rather than the full volume of the church. Some of the changes that can help with this will be 'soft' changes – others will relate to the heating system itself.

Finally, we make recommendations about moving away from fossil fuels. Moves away from fossil fuels are key to cutting emissions. For most churches, this will involve moving from gas, oil or LPG to electricity. Electricity currently creates carbon emissions around the same level as mains gas, but the carbon emissions associated with it are reducing rapidly as the UK builds more renewable energy and decommissions its remaining oil and 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'. Some local areas may also be considering the option of district heating networks.

While moving away from fossil fuels may not always be possible, as the principles state, "churches should be expected to have at least carefully considered the option of moving away from fossil-fuel based heating (gas and oil boilers) towards electric-based heating." And if such options are not viable now, the churches "can try to be ready for a future retro-fit when technology and the grid has progressed."

The boilers are fairly new and therefore are not expected to reach the end of their serviceable life until around 2035 and should be used for this time. Prior to the replacement of the gas heating system with an electrical heating solution as outlined below, the PCC can take some further steps to reduce the heating energy consumption.

Where radiators do exist, these do not have any local control and TRVs should be installed on each radiator to allow closer control and to allow the radiators within the gallery (which is rarely used) to be switched off for most of the time.

For smaller mid-week services where the congregation is limited to typically 20 people. It is not efficient to heat the entire air volume within the church for this short period. Instead, it is recommended to install electric under pew heaters to a small number of pews within the central aisle to provide responsive heating for these services and other small meetings and events. If the pews are removed, the central aisle becomes more difficult to heat as there is not an easy solution to site heat emitters. Underfloor heating would not be recommended unless the church was in constant use throughout the week.

When the boilers do require replacement (c. 2035) and depending on the usage of the church at this time, either an electric heating solution or an air source heat pump solution is suggested. If usage is intermittent or similar to the current situation, an electric heating solution could comprise of perimeter far IR panel heaters and pulsar heaters could be hung within the central aisle (as lights are already hanging in chandeliers). The table below provides some further detail on one proposed route to decarbonised heating.

Alternatively, if usage is more consistent, the existing heating distribution system could remain or be adjusted to support an air source heat pump.

Area	Type/ Size	Length (mm)	Watts	Number (or m) Required
Vestry	Electric Far IR Wall Panel 1200W	1200	1200	1
Vestry WC	Electric Far IR Wall Panel 580W	1000	580	2
Central aisles	Electric Under Pew 650W	948	650	24
Chancel/choir stalls	Electric Under Pew 650W	948	650	12
Organ heater	Electric tubular heater	-	450	1
Chancel	Electric Far IR Wall Panel 1200W	1200	1200	3
All pews on ground floor	Electric Under Pew 650W	948	650	90
Galleries	Electric Under Pew 650W	948	650	132
Narthex	Pulsar 2400W	-	1800	6
WC	Overhead Far IR Bar Heater 1.5kW	1580	1500	2
Choir vestry	Electric Far IR Wall Panel 1200W	1200	1200	2
Managers office	Electric Far IR Wall Panel 580W	1000	580	1

6.1 Optimise Heating Controls

Most traditional churches were constructed without any form of heating. The modern addition of heating is not needed to preserve the fabric but only to provide thermal comfort to occupants. The previous trend of 'conservation heating' for fabric issues is now largely considered to be unnecessary and is being avoided by the likes of National Trust and English Heritage. The only times when background heating may be required is if there are historic wall paintings or to for the preservation of large artefacts such as tapestries. The organ (and other sensitive areas such as historic papers stored in the vestry) may require some local background heating specific to that area. In general, sensitive paper records should be removed for storage in the county

archive. Organs can be installed with a local background tube heater such as https://www.dimplex.co.uk/product/ecot-4ft-tubular-heater-thermostat within the organ casing in order to provide the heat where it is required. The fabric is often subject to the greatest damage by humidity (which is naturally higher when the air is warmer as warmer air has greater capacity for holding more moisture), as a result of large temperature swings (from central heating systems turning on and off) and from the excessive drying out/baking of timbers where high temperature heating units have been fixed to them (such as overhead heaters fixed to timber wall plates).

Providing background heating to the church building as a whole is excessive and wasteful of energy. At the very least we would recommend that any background level is reduced to a maximum of 12°C and ideally avoided all together with the heating only switched on during occupied periods.

6.2 Install Electric Under Pew Heaters

Currently the whole church is required to be heated for smaller services, where only a small number of people (c.20) attend. This takes a large amount of gas to heat the whole space, therefore we recommend the creation of a warm zone at the centre of the church using electric pew heaters. This would be with the installation of the pew heaters to selected pews for the midweek services.

In time, when the gas boiler requires replacing, the number of pew heaters could then be extended to the whole of the church, based on the congregation size, or instead install an Air Source Heat Pump (see Section 8.2)

For replacement, two most popular under pew heaters within churches are BN Thermic PH65 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating.

6.3 Electric Panel Heating to Churches

In addition to the pew heaters, there are other areas which will also require heating that do not have pews, such as the vestry, altar, chancel etc. It is recommended that the PCC consider installing electrical panel heaters in these areas on a time delay switch and remove the existing radiators.

Suitable electric panel heaters would be far infrared panels such as https://www.warm4less.com/product/63/1200-watt-platinum-white- . 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 cannot be left on accidently after use.

These heaters have a strong radiative effect (where heat is reflected to people from the surface) as well as a light convective effect (where air is warmed and moves around to heat the general space). For this reason, these heaters tend to provide a relatively instant sense of heat and comfort within the space and only need to be on for short periods of time. This reduces the

amount of preheating required before each use of the building and can make electric heating cost competitive with gas. It also means that the building can rapidly and economically be brought into used for short or unplanned meetings if needed.

7. Energy Saving Recommendations

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

7.1 New LED Lighting

The lighting makes up a relatively small overall energy proportion of the electricity used within the church. There are some areas of the building which have had efficient LED lights installed but there still remains some inefficient fluorescent fittings within the Parish Centre.

The LED programme is already scheduled in for September 2021, but this section is included for completeness. 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 on a simple "like for like" the total capital cost (supplied and fitted) would be £3,694. The annual cost saving would be £281 resulting in a payback of around 13 years. This estimate includes for the supply of the lights, the labour to install them and the access required. It does not include for any upgrade to the wiring or a new lighting design both of which the church may wish to consider. Guidance on lighting, produced by Historic England for churches, can be found at https://historicengland.org.uk/advice/caring-for-heritage/places-of-worship/making-changes-to-your-place-of-worship/advice-by-topic/lighting/

There are some fittings such as 2D fluorescent where the existing fitting can be made more efficient by simply changing the bulb/lamp within the existing fitting to new LED bulb/lamp. This could be carried out by competent members of the churches internal team, very cost effectively and would be a List A item so no permissions would be required.

7.2 Lighting Controls (Internal)

There are several lights which currently remain on all the time in areas such as corridors, toilet areas, staircases, and the like. Some of these areas are only used occasionally and for a short amount of time so that, in actuality, the light does not need to remain on constantly. There are

also spaces which benefit from a good amount of natural daylight coming in through the windows, such that artificial lighting is not required for much use during the year.

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 considered 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.

7.3 Refrigeration Controls

Within the kitchen area there is a fridge for the storage of milk and perishable foods. 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/. (Note the self installed SavaPlug has been discontinued, but the professionally installed Savacontrol option is available) The installation does not cause any significant disruption to operations and can be undertaken during normal operating times.

7.4 Insulation of Pipework and Fittings

The pipework within the plant room has the majority of its straight lengths insulated but the

more complex shaped pipework fittings, such as flanges and valves, have been left uninsulated. These exposed areas of pipework contribute significantly to heat loss from the system and make the plant room unnecessarily warm. The exposed hot surfaces also represent a health and safety risk of burns for those working in the area.

It is recommended that these areas of exposed pipework and fittings are insulated with bespoke flexible insulation jackets. These wrap around the various elements but can be removed and then replaced for any servicing activities.

A free survey and quotation for the supply and installation of insulation of pipework fittings can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 930 9689, adrian@esos-energy.com).

7.5 Reflective Radiator Panels

The building is heated in most areas by radiators served from the boiler, located on external walls. They therefore lose much of their heat into the masonry of the wall behind the radiator rather than giving it out into the building.

In order to improve the insulation directly behind the radiators, a reflective panel can be installed. This helps to make sure more of the heat from the radiator goes into the space and requires less overall heating from the boiler to achieve the set point. There are a wide variety of reflective panels for installing behind radiators on the market. It is recommended that these panels are installed behind all radiators within the building

The installation of radiator panels can be carried out by anybody competent in basic DIY and does not require the radiators to be removed.

7.6 Thermostatic Radiator Valves (TRVs)

The building is mostly heated by radiators and not all of these have thermostatic radiator valves (TRVs) installed on them.

TRV's can be installed on the existing radiator and allow the users of the room to have some element of control over the temperature in the room. They prevent over-heating and hence situations where the heating is on and the windows are open. They also allow unused spaces to have the heating in them turned down.

It is recommended that TRVs are installed on all radiators and users advised as to the best way to operate these once they have been installed. TRV's can be supplied and installed by any good heating engineer.

7.7 Timers on Fused Spurs to Water Heaters

There are various electric hot water heaters and water boilers (for tea making, hand washing and

the like) located around the church. 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 . 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.

7.8 Replacement Windows

The windows on the building are single glazed with metal casements in stone mullions and as such are very poor in terms of thermal quality. In addition, many of the openings do not close well against the frames and excessive cold air is being let into the space.

The introduction of new double glazed units would considerably reduce the heat loss from the building and improve thermal comfort. This measure would be costly and disruptive to install but could be considered as part of a refurbishment programme. The use of high quality windows will also reduce external noise transfer and provide added security. To enhance heat ingress in particularly cold areas, double glazing with low emissivity (Low-E) glass could be selected as this allows more solar gain than standard double glazing.

It is therefore recommended to replace these windows with new double glazed windows with wooden/aluminium/uPVC casements set into the existing surrounds. It is suggested that any window installation is undertaken by a FENSA Approved Installer www.fensa.org.uk

7.9 Insulation to Roof

The loft void above the main church ceiling was reported to have little or no insulation present. In all cases where there is 100mm or less of insulation within accessible roof spaces it is recommended that insulation be added to prevent heat loss and create a more comfortable environment for the occupants of the building.

Because heat rises, the ceiling/roof of a building is the largest contributing area to heat loss from a building. The insulation of such spaces can therefore have a dramatic impact on both the efficiency of the heating system and the temperature of the space below. Insulation measures such as this also need to be combined with control measures such as TRV's or room sensors to ensure that the space does not overheat because of the additional insulation.

A free survey and quotation for the supply and installation of insulation to the loft spaces can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 930 9689, adrian@esos-energy.com).

8. 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- South aisle and South nave roof can support arrays
Wind	No – no suitable land away from buildings
Battery Storage	No – no viable PV
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 – could replace gas boilers at end of life
Ground Source Heat Pump	No – archaeology in ground and radiator system

8.1 Solar PV

There is potential for a small PV array on the roof of the South Aisle and South Nave. The current arrangements around solar panels mean that to be financially viable the building on which they are mounted needs to consume the vast majority of the energy that they produce. The church's energy consumption is already very small and the consumption during the daytime when the sun is shining is likely to be very low indeed, therefore while technically viable only a very small number of panels (maximum of around 4) would be worth considering if at all. However, as the church moves to electrified heating, a larger solar array would be viable, particularly if installed with battery storage technology.

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 church. This is a new but fast-growing technology with prices expected to fall substantial over the next 2 to 3 years.

8.2 Air Source Heat Pump

The building is currently heated from a gas boiler which provides hot water into the heating system. The use of fossil fuels for heating means that it will not be possible for the building to become zero carbon without changing the heating system. A boiler also has heat and other efficiency losses within it, which means that the efficiency of a boiler in converting the gas into the heat is typically around 80 to 95% (depending on the age and type of boiler). Air source heat pumps use electricity to power the heat pump which takes heat from the air and puts this into water which can then go into the heating system. A heat pump can create around 3 units of heat for every one unit of electricity.

The existing boiler still has a number of years of services left, however it is recommended that the church start considering what options are suitable for the church when the boiler will need replacing, and start planning for that, and an ASHP should be a serious consideration.

A new air source heat pump is likely to need a heating capacity of around 152kW and could be located in the existing boiler room. As heat pumps operate on a low temperature basis some of the radiators and other heat emitters around the site may require upgrading. 3 phase electrical power (already on site) may also be required to power the units.

Good local renewable companies can be contacted for further detailed assessment of heat pumps and quotes or contact www.yourfutureenergy.co.uk

There are currently government incentives available for installing air to water heat pumps but these are subject to future change and adaption so should be reviewed at the time of implementation.

9. 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-Jan-2019.pdf .

10. 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.

11. Offsetting

As you take action to reduce your emissions, you may also wish to offset those that you cannot yet reduce. If you would like to engage in offsetting, it is important to use a reputable scheme. The Church of England recommends Climate Stewards, which has a simple calculator that can help you to work out how much you would need to offset. https://www.climatestewards.org/

Climate Stewards encourages people to 'reduce what you can and offset the rest' as part of your journey to Net Zero carbon emissions. They provide training and resources to help you understand climate change and its impacts, and to calculate the carbon footprint from your activities including travel, energy, expenditure, and food. Their online carbon calculators for individuals and smaller organisations are free to use, and they provide bespoke carbon footprint audits for larger organisations.

Having reduced as much of your organisation's carbon footprint as you can, there will always be unavoidable emissions from your work and travel. Carbon offsetting allows you to compensate for the negative impact of your carbon emissions by funding projects which take an equivalent amount of CO2 out of the atmosphere. These either involve locking up ('sequestrating') CO2 as trees grow, or reducing emissions by using low-carbon technology such as fuel-efficient cookstoves or water filters.

Climate Stewards has a close relationship with all their project partners in Ghana, Uganda, Kenya, Tanzania, Nepal and Peru. They work closely with them to design, develop, implement and monitor projects which will not only mitigate carbon, but also bring tangible benefits to the local community - including improved health, savings in time and money previously spent on buying or collecting fuel, and improvements in local biodiversity. Each project is assessed using their Seal of Approval protocol which enables us to assess and monitor carbon mitigation and ensure robust, sustainable and transparent partnerships.

Appendix 1 – Schedule of Lighting to be Replaced or Upgraded

Room/Location	Number of Fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
Vestry	1	5ft Single Proteus LED	£3	£88	27.37
WC	2	5ft Single LED	£5	£24	4.35
Church	10	2D LED 11W	£9	£588	62.20
Church	40	2D LED 11W	£224	£680	3.04
Church	2	5ft Single LED	£6	£34	5.73
West porch	1	5ft Single LED	£2	£127	69.73
Narthex	6	5ft Single Proteus LED	£3	£764	238.74
Kitchenette	2	5ft Single Proteus LED	£5	£176	35.07
WC	2	LED GLS	£5	£118	22.21
WC	2	5ft Single Proteus LED	£6	£118	20.21
Choir vestry	1	5ft Single LED	£3	£88	35.07
Choir vestry	1	2D LED 11W	£4	£88	25.07
South porch	1	2D LED 11W	£2	£127	69.73
Manager's office	1	5ft Single LED	£2	£127	69.73
South porch	1	5ft Single LED	£3	£12	4.35