ESOS-ENERGY
Energy efficient solutions

# Energy Efficiency and Zero Carbon Advice

## Holy Trinity
## PCC of Holy Trinity

THE CHURCH OF ENGLAND BIRMINGHAM

| Author | Reviewer | Date | Version |
|---|---|---|---|
| Tamsin Hockett | David Legge | 24th June 2021 | 1.0 |

# Contents

# 1. Executive Summary

An energy survey of Holy Trinity 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.

Holy Trinity was constructed in 1875 and the parish centre was added in 1975 at the Western end. The church is built of local stone with an exposed planked wooden ceiling and a small void above. The church has reordering plans to remove the pews, change the entrances and reorder the toilets. 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) |
|---|---|---|---|---|---|---|
| Install an Air Source Heat Pump into the building to replace existing heating system | 37,135 | -£1,518 | £27,600 | N/A | Faculty | 5.76 |
| Consider install Electric Vehicle Charging Points | 0 | N/A | £2,500 | N/A | Faculty | - |
| Install SavaWatt devices on fridges and freezers | 140 | £24 | £50 | 2.10 | List A (None) | 0.04 |
| Fit timed fused spurs to hot water heaters | 162 | £28 | £90 | 3.26 | List A (None) | 0.04 |
| Insulate exposed pipework and fittings in plantrooms | 7,650 | £172 | £600 | 3.49 | List A (None) | 1.41 |
| Install PIR motion sensors on selected lighting circuits | 383 | £65 | £547 | 8.38 | List B | 0.10 |
| Install thermostatic radiator valves (TRVs) | 9,180 | £207 | £1,760 | 8.52 | List A (None) | 1.69 |
| Inject cavity wall insulation into parish centre walls | 12,240 | £275 | £2,400 | 8.71 | Faculty | 2.26 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fit 270mm of insulation into the roof space | 15,300 | £344 | £4,000 | 11.62 | Faculty | 2.82 |
| Change existing lighting for low energy lamps/fittings | 3,390 | £577 | £11,276 | 19.53 | Faculty | 0.86 |
| Install Draughtproofing to External Doors | 4,590 | £103 | £3,200 | 30.99 | List B | 0.85 |
| Repair and replace windows | 22,950 | £516 | £17,000 | 32.92 | Faculty | 4.24 |

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

Based on current market prices of 17p/kWh and contracted price of 2.25p/kWh for electricity and mains gas respectively.

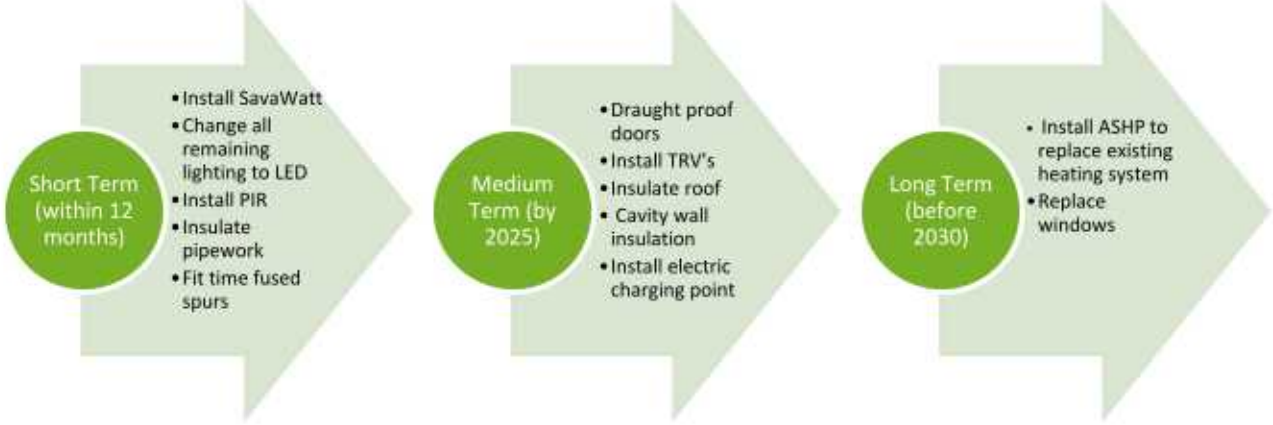
**If all measures were implemented this would save the church £795 per year and reduce its carbon footprint by 20.06 tonnes (63%).**

## 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 Holy Trinity 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 Holy Trinity, Halesowen Road, Old Hill, Cradley Heath B64 6JA was completed on the 20th April 2021by 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.

| Holy Trinity | |
|---|---|
| Church Code | 642210 |
| Gross Internal Floor Area | 900 $m^2$ |
| Listed Status | Grade II |

The church typically used for 6 hours per week for the following activities

| Type of Use | Hours Per Week (Typical) | Average Number of Attendees |
|---|---|---|
| Services | 5 hours per week | 145 |
| Meetings and Church Groups | 0.5 hours per week | |
| Occasional services (weddings, funerals, etc) | 0.5 hours per week | |

# 4. Energy Usage Details

Holy Trinity uses 14,000 kWh/year of electricity, costing in the region of £2,385 per year, and 153,000 kWh/year of gas, costing £3,443. The total carbon emissions associated with this energy use are 31.78 $CO_2e$ tonnes/year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. Holy Trinity has one main electricity meter, serial number E11Z05378. There are two gas meters serving the site, serial numbers M25A0079711D6 (Church) and E016K00816 20 D6 (Meeting rooms).

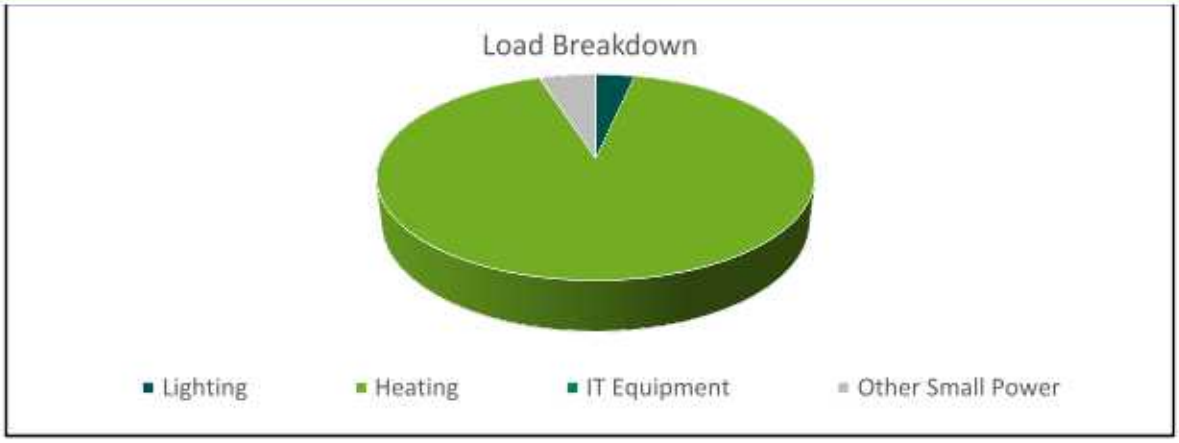
| Utility | Meter Serial | Type | Pulsed output | Location |
|---|---|---|---|---|
| Electricity – Church | E11Z05378 | EDMI Atlas MK10D | Full AMR connected | Vestry Cupboard |
| Gas – Church | M25A0079711D6 | Itron MDA 25 | Full AMR connected | Boiler room, crypt |
| Gas - Hall | E016K00816 20 D6 | Honeywell Themis BK G10E | No, but no AMR | Ladies WC |

Some of the meters are AMR connected and as such energy profile for the entire energy usage should be possible. Half hour meter data has been provided for the purpose of this report and this has been used to verify the data.

## 4.1 Energy Profiling

The main energy consuming plant can be summarised as follows:

| Service | Description | Estimated Proportion of Usage |
|---|---|---|
| Lighting | Lighting is predominantly CFL lighting in the main church with a variety of inefficient lighting including SON, T12 and T8 fluorescent lighting | 3% |
| Heating | Provided by gas fired boilers to perimeter radiators throughout. | 92% |
| IT Equipment | Parish office computer and printer | 0.07% |
| Other Small Power | Kitchen appliances, portable electric heaters, plug loads and other small power | 5% |




As can been seen from this data, the heating makes up by far the largest proportion of the energy usage on site.

## 4.2 Energy Benchmarking

In comparison to national benchmarks for church energy use Holy Trinity uses 22% less electricity and 13% more 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 |
|---|---|---|---|---|---|
| Holy Trinity (elec) | 900 | 14,000 | 15.56 | 20.00 | -22% |
| Holy Trinity (gas) | 900 | 153,000 | 170.00 | 150.00 | 13% |
| TOTAL | 900 | 167,000 | 185.56 | 170.00 | 9% |

## 5. 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."

During the survey it was stated that the midweek and evening services are only attended by around 20 people and as such are held in the meeting rooms / main hall which is commendable to reduce the need to heat the entire air volume of the church and as recommended by the DAC heating advisor.

The main church is background heated at present and boosted for services. The background heating should be discontinued (see section below) wherever possible.

The current boilers were installed in c. 2008 and as such their serviceable life should see them to around 2030. At this stage, it is recommended that the gas boilers are replaced with an Air

Source Heat Pump (ASHP) which can distribute the heat via a variety of different solutions which may include triple fin radiators and fan coil heaters. The use of underfloor heating would not be recommended unless the church maintains continuous use and even then, the fabric may preclude this from being an altogether efficient system.

The near infrared heaters should be replaced with more efficient far infrared heaters wherever possible (which would also serve to remove the red glow!). 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.

The planned reordering of the church will remove the pews but retain the raised pew platforms and these should be insulated to reduce heat loss through the floor as part of the reordering works. It is also recommended that where smaller numbers of occupants are using the building, both now and in the future, the church centre is used to reduce the need to heat the large air volume within the church itself.

# 6. 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.

## 6.1 New LED Lighting

The lighting makes up a relatively small overall energy proportion of the electricity used within the church. The lighting is predominantly fluorescent/halogen/SON fittings throughout the church building and hall.

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 £11,276. The annual cost saving would be £577 resulting in a payback of around 20 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 WC's where the existing fitting can be made more efficient by simply changing the bulb/lamp within the existing fitting to w 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.

## 6.2 Lighting Controls (Internal)

There are several lights which currently remain on for longer than necessary in areas such as WC's 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.

## 6.3 Refrigeration Controls

Within the church centre there are domestic refrigeration units such as fridges and freezers within the kitchen area. 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.

## 6.4 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).

## 6.5 Thermostatic Radiator Valves (TRVs)

The church is 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.

## 6.6 Timers on Fuse Spurs to Water Heaters

There is an electric point of use water heater in the kitchen to provide hot water for tea making and the like. This only needs to heat the water to the required temperature when the building is in occupation but at the moment this heater is directly wired in without any form of time control and therefore maintains it 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.

## 6.7 Draught Proof External Doors

There are a number of external doors in the church. The historic timber doors do not close tightly against the stone surround and hence a large amount of cold air is coming into the church around the side and base of these doors.

It is recommended that the draughtproofing around the door is improved and draught strips are added. This could be achieved in a number of ways:

For timber doors that close onto a timber frame 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

Or

For timber doors that close onto a stone surround more traditional solutions such as brush draught strips rebated into the edge of the door by a skilled joiner. Other traditional methods such as using hessian or felt pads tacked to the door could be used. Keeping the door maintained in a good condition is also important.

Simple measures such as having a 'sausage dog' style draught excluder laid along the base of a door (it needs to be sufficiently heavy to stay in place), using plasticine of the right colour to fill gaps where daylight can be seen, and putting painted fridge magnets over large keyholes can all be simple DIY measures which are effective.

## 6.8 Replace and Repair Glazing

The windows in the church centre are single glazed in wooden frames, and as such are very poor in terms of thermal quality. In addition, the church has several windows that are damaged with broken panes 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 aluminium or composite casements set into the existing surrounds. It is suggested that any window installation is undertaken by a FENSA Approved Installer www.fensa.org.uk

All broken single glazing within the church windows should be repaired to reduce the cold air ingress into the church at the earliest opportunity.

## 6.9 Cavity Wall Insulation

The church centre is constructed with a cavity wall method, and the inspection of the wall showed no signs that insulation has been added. Prior to the early 1990's, building regulations did not require walls to be fully insulated and therefore it is likely that there is no insulation present. It could, however, be added through injection into the cavity walls.

It is recommended that cavity wall insulation is considered and added to the walls where appropriate. A survey to check the width of the cavity, exposure of the wall and condition of the cavity should be carried out by a CIGA-approved installer who will then be able to provide you with a quotation to undertake the works. Installing cavity wall insulation will help to reduce heat loss and improve the comfort of the space, but needs to be considered alongside other 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 9309689, adrian@esos-energy.com).

### 6.10 Insulation to Roof

The loft void above the ceiling of the church centre reported by the church wardens to have little or no insulation present. We also found the same in the office space in the tower and above the bell ringer's chamber.

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.

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 9309689, adrian@esos-energy.com).

## 7. Other Recommendations

### 7.1 Electric Vehicle Charging Points

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

Installing a unit such as a Rolec Securi-Charge http://www.rolecserv.com/ev-charging/news/view/Robust-EV-Charging-With-Rolecs-SecuriCharge-EV-Wall-Unit-Coin-Token-PAYG would allow the organisation control over who is allowed to use the unit with a key operated system. Or given the type of use of the building and control over the usage of the car park as a whole a simple 32 amp type 2 wall pod type charger may be most suitable and these are widely available through many suppliers such as http://www.rolecserv.com/ev-charging/product/EV-Charging-Points-For-The-Home.

Because of the parish office within the building, the church can be considered as a place of work and, as such, installation grants are available through the workplace charging scheme https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers which will fund 75% of the installation cost up to £500.

# 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- Grade II listed but the 1975 parish centre may be suitable and could be used for school or ASHP |
| Wind | No – no suitable land away from buildings |
| Battery Storage | Yes |
| 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 | No – archaeology in ground and radiator system |

There is potential for a small PV array on the roof of the parish centre. The listed status of the building probably precludes the installation of panels to the South roof but the electrical demand within the church would also provide a limiting factor as the church is not in use for large parts of the week.

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. At this stage, PV is potentially viable, but other measures and an agreed approach to the heating system should be considered prior to the application for a solar PV array, which may be turned down as the church is listed. The proximity of several large trees would also require consideration as to the potential shading of any array and would most likely require a combination of tree coppicing, as well as micro-inverters on the array to maximise efficiency.

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.

## 8.1 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 is expected to reach the end of its serviceable life in around 8-10 years and it is therefore recommended that the replacement of the existing boiler for an air source heat pump is considered at that time and that succession planning for the existing gas boiler is started.

A new air source heat pump is likely to need a heating capacity of around 200kW and could possibly 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 may also be required to power the units which is already in place at the church.

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 |
|---|---|---|---|---|---|
| Main hall | 4 | 600 x 1200 50W Panel (AG) | £21 | £610 | 28.91 |
| Corridor | 3 | 600 x 1200 50W Panel (AG) | £31 | £366 | 11.75 |
| Upstairs gallery | 8 | 5ft Single LED | £30 | £817 | 27.06 |
| Stairs | 1 | 5ft Single Proteus LED | £8 | £185 | 23.61 |
| Main hall | 16 | 5ft Single LED | £362 | £1,405 | 3.88 |
| WCs | 4 | 5ft Single LED | £15 | £351 | 23.26 |
| WCs | 3 | 2D LED 11W | £5 | £208 | 40.12 |
| Church | 13 | LED GLS | £86 | £928 | 10.85 |
| Chancel/altar | 4 | 3 Spot Track lights | -£4 | £4,000 | -904.55 |
| Vestry | 1 | 5ft Single Proteus LED | £2 | £127 | 59.28 |
| Vestry | 1 | 5ft Single Proteus LED | £3 | £127 | 48.39 |
| Bell ringers floor | 2 | 5ft Single LED | £6 | £233 | 39.53 |
| Prayer room | 4 | R63 LED | £7 | £86 | 13.09 |
| Noticeboards | 4 | 4ft Single LED | £6 | £286 | 46.78 |