ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

St Peter's Church
2buy2 Church of England Audits

THE CHURCH OF ENGLAND
Diocese of Chester

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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 is a Grade I listed church located in the centre of Chester. The church is said to have been founded by Ethelfleda in 907, the present structure is C14, C15 and C16 which was altered and restored in the C17, C18 and C19. The church is of red sandstone and the roof is not visible from the roadside but is low pitch with a camber beam roof.

The church is open 6 days per week with a café open from Tuesday to Saturday which is well frequented given its location and there are two Sunday morning services. The church has the main nave which has a flexible seating arrangement as well as a separate room within the South aisle. The church also has a small kitchen and servery for the café, two galleries, first recorded in 1637, which are not publicly used, office and WC. 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)
Upgrade incoming electrical supply capacity to power decarbonised heat solution	0	N/A	£14,356	N/A	Faculty	N/A
Replace parts of heating system for electrical based heating solution	4,050	-£4,184	£7,595	-1.82	List B	0.02
Refurbish window ironmongery / draught seals	4,499	£450	£400	0.89	Consult DAC	0.81
Install SavaWatt devices on fridges and freezers	540	£162	£170	1.05	List A (None)	0.11
Change existing lighting for low energy lamps/fittings	3,330	£999	£1,390	1.39	Consult DAC	0.70

Fit timed fused spurs to hot water heaters	324	£97	£180	1.85	List A (None)	0.07
Install PIR motion sensors on selected lighting circuits	49	£15	£61	4.14	List B	0.01
Install a Solar PV array to roof of building (assumed 100% of energy generated used in building)	6,561	£1,968	£17,266	8.77	Faculty	1.38
Install Draught-proofing to External Doors	2,699	£270	£3,200	11.85	Consult DAC	0.49
Install an Air-to-Air Source Heat Pump to replace the existing main heating system	45,069	£1,932	£31,500	16.31	Faculty	7.71

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

Based on current contracted prices of 30/kWh and 10p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church £1,709 per year and reduce its carbon footprint by 11.3 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:

Short Term (within 12 months)

- Change all remaining lighting to LED
- PIR sensors
- SavaWatt

Medium Term (by 2025)

- Draught proof doors
- Refurbish windows
- Timed fused spurs
- Upgrade incoming electrical supply

Long Term (before 2030)

- Replace heating sytem with electric heating and AASHP
- Solar PV

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, Watergate Street, Chester, CH1 2LA, was completed on the 14th of December 2022 by 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	609024
Gross Internal Floor Area	419 m^2
Listed Status	Grade I

The church typically used for 46 hours per week for the following activities

Type of Use	**Hours Per Week (Typical)**	**Average Number of Attendees**
Services	3 hours per week	40
Meetings and Church Groups	1 hours per week	
Community Use	42 hour per week	

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

4. Energy Usage Details

St Peter's Church uses 7,976 kWh/year of electricity, costing in the region of £2,400 per year, and 89,979 kWh/year of gas, costing £9,000. The total carbon emissions associated with this energy use are 17.88 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 20S0010535. There is one gas meter serving the site, serial number M016A0898309A6.

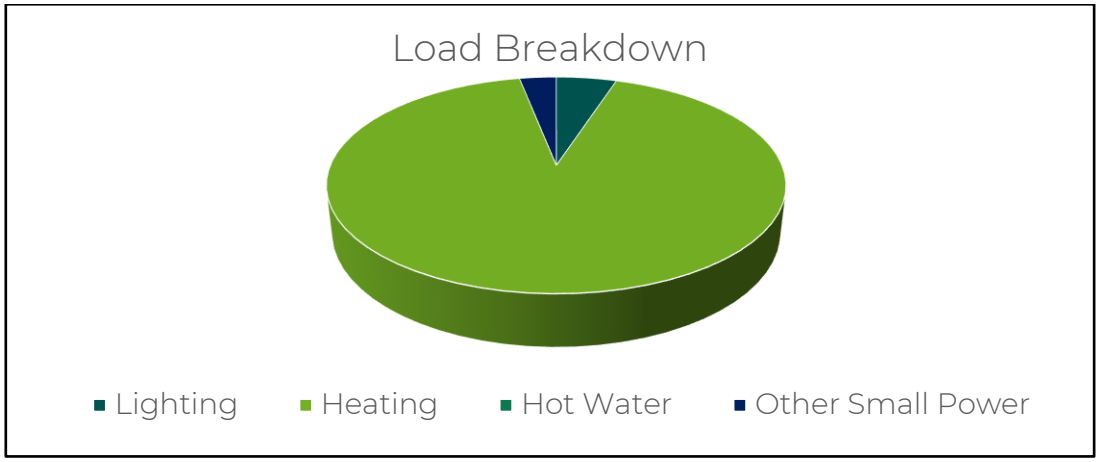
Utility	Meter Serial	Type	Pulsed output	Location
Electricity	20S0010535	1 phase 100A	Yes, fully AMR connected	S porch mains room
Gas	M016A0898309A6	MDA 16	Yes, fully AMR connected	Boiler room

All 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 mixed with some large CFL lamps in chandeliers as well as T8 fluorescent fittings and LED fittings in some areas	5%
Heating	Provided by a gas fired boiler to cast iron radiators and low level perimeter pipework	92%
Hot Water	Electric point of use water heaters to kitchen and WC	0%
Other Small Power	Organ and sound system, fridges and kitchen appliances, office equipment and other plug loads	3%



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 St Peter's Church uses 5% less electricity and 43% 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
St Peter's Church (elec)	419	7,976	19.04	20.00	-5%
St Peter's Church (gas)	419	89,979	214.75	150.00	43%
TOTAL	**419**	**97,955**	**233.78**	**170.00**	**38%**

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.

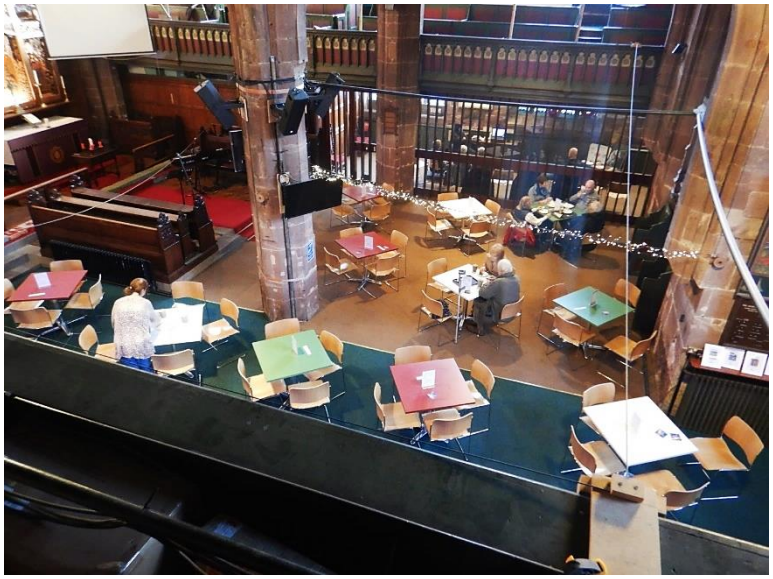
Our recommendations on heating generally fall within three major areas. Firstly, for all churches we make recommendations that will help to reduce energy wastage and, as a starting point, to optimise the system that you already have

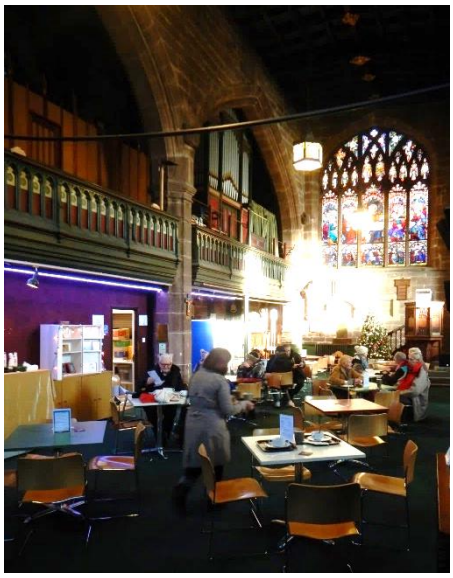
Secondly, we recommend options for many churches that focus on heating people rather than the full volume of the church. Some of the changes that can help with this will be 'soft' changes – others will relate to the heating system itself.

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 biogas 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 church is used daily as a community café and is open 5 days per week (Tuesday to Saturday) for café use and for services on a Sunday morning. The church is closed on a Sunday. The church has a flexible seating arrangement throughout with a separate room within the South aisle next to the vestry. There is also a separately partitioned office to the North gallery.





The church is currently heated by an end of life Ideal gas fired boiler via three heating circuits to cast iron radiators and exposed pipework which runs at low level around the perimeter of the church and to the galleries.

The church has limited external space but does lease a small area to the NW of the building to the adjacent pub as a bottle store, which is also above the basement level plant room. This area would be suitable for the location of an air source heat pump. It is recommended that as the heating distribution system is now also aged and showing signs of deterioration, the heating system is considered for replacement as a whole. Given the church is in daily use, it would be recommended that an air to air source heat pump is installed to provide heating to the church. An alternative would be to consider a high temperature air to water source heat pump to provide sufficient heat, and whilst this would be a viable solution, both the capital and operational costs are thought to be higher than the installation and running of an air to air source heat pump.

The various options for a decarbonised heating solution have been reviewed in the table below.

Decarbonisation Heating Solution	Viable
Air to Water Source Heat Pump	Yes – but not preferred solution
Air to Air Source Heat Pump	Yes – preferred solution for main heating to church
Water Source Heat Pump	No – no water source locally
Ground Source Heat Pump	No – significant archaeology
Under Pew Electric Heating Panels	No – no fixed pews
Electric Panel Heaters	Yes –to provide heat to smaller rooms and areas
Over Door Air Heater	Yes – supplemental warm welcome at the door only
Overhead Infra-Red Heaters	No – visual intrusion to the church would do harm, least preferred heating source due to comfort
Heated Chair Cushions	No – other solutions preferred

The recommendation is therefore that the church consider installing and air-to-air source heat pump and electric panel heaters for supplementary heating as described below.

5.1 Air to Air Source Heat Pumps

Air-to-Air Source Heat Pumps (AASHP) work by having an external unit which sucks air in and extracts the heat from it. The pumps concentrate this heat and put it into a refrigeration gas (in the same way as a fridge or freezer works). This refrigeration gas is then piped inside the building in a small pipe where is it then allowed to expand in an internal unit with a fan. This heat is then blown out into the space. This system is identical to an air conditioning system, but it works in reverse to heat the space. As warm air is blown into the space this type of system can heat spaces from cold relatively quickly. Air-to-Air Source Heat Pumps provide around 4.5 units of heat for every 1 unit of electricity used in the heat pump; they therefore have a Coefficient of Performance (CoP) of 4.5.

The Centre for Sustainable Energy model[1] can be used to estimate heat load for the building.

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

Insulation Factors

Condition	Factor kW/m^3
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

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

Area	Volume m^3	Insulation Factor kW/m^3	Heat Required (Space heating) kW
Church	4,022	0.033	132

Therefore, a heat pump of 132 kW would be required.

AASHPs require the installation of external units which look like air conditioning modules in well ventilated external locations. These external units will need an electricity supply and pipework running from them to the heating system. They will also need a drain nearby as the back of the units can build up moisture, which condenses and sometimes freezes on the coils. The larger units do create some low-level noise and therefore the location and baffling of the units may need to be considered carefully.

Examples of external units for ASHP comprising of three smaller 3kW units and two larger 10kW units.

Internal units come in a variety of styles. The most appropriate internal units for most churches are floor mounted units which look very similar to a fan convector heater.

FUA-A - Under ceiling cassette air conditioning unit

Unique under ceiling cassettes for high rooms with solid ceilings or false ceilings with a shallow void. Suitable for all types of commercial applications.

The FUA-A range provides comfortable heating and cooling even for rooms with high ceilings and has individual louvre control flexibility to suit every room layout.

FTXM-R - Wall mount air conditioning unit

Attractive, wall mounted design with perfect indoor air quality. 2 area motion detection sensor: air flow is sent to a zone other than where the person is located at that moment; if no people are detected, the unit will automatically switch over to the energy-efficient setting.

FVXM - Floor Mount Air Conditioning Unit

Designed to fit rooms of any size and shape, it blends well with the interior due to the new design which incorporates more flowing lines and softer edges. These units are ideal when it is not possible to fit a high level wall mount unit for aesthetic or practical reasons.

They are suitable for a wide range of applications including domestic, small to medium offices and commercial uses.

All these units do have a fan element within them and therefore a small amount of fan noise is emitted. This tends to be less than a fan convector heater on a boiler-based system and similar to the noise from a fridge or freezer. Air conditioning units are commonplace in hotel rooms, indicating that the noise is low enough even to be suitable for sleeping environments.

A case study of a church which has installed such a solution is available at 5. Air-source heat pumps at Hethel Church - All Saints Church, Hethel - A Church Near You

5.2 Install Electric Panel Heaters

It is recommended that the PCC consider installing electrical panel heaters in the areas specified on the table below on a time delay switch and remove the existing radiators.

Area	Type/ Size	Length (mm)	Watts	Number required
Vestry	Overhead Far IR Bar Heater 1kW	1080	1000	2
S aisle room	Overhead Far IR Bar Heater 1.5kW	1580	1500	4
Gallery office	Electric Far IR Wall Panel 1200W	1200	1200	1
WC corridor	Electric Far IR Wall Panel 1200W	1200	1200	1
WC	Overhead Far IR Bar Heater 1.5kW	1580	1500	1

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.

5.3 Upgrade to 3 Phase Electricity Supply

To be able to have sufficient electrical power to supply enough energy into an electrical heating system the church will need to increase the existing electrical supply from single phase 100A supply to a 3 phase 100A supply.

The upgrade to the supply has to be carried out by the District Network Operator in the areas.

The DNO in your area is thought to be SP Energy Networks - www.spenergynetworks.co.uk; 0300 1010 444 (Central and Southern Scotland, Merseyside, Cheshire, North Wales, and North Shropshire))

The cost of bringing in a new 3 phase supply can range from £300 to £30,000 but the DNO will provide a quotation for free so it is well worth obtain a quotation in the short term so that decisions can be made on a well-informed basis.

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. There are some areas of the building which have had efficient LED lights installed but there still remains a large number of inefficient fluorescent and GLS fittings within the south aisle, north aisle, and vestry.

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 £1,400. The annual cost saving would be £1,000 resulting in a payback of around 1.4 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/

6.2 Lighting Controls (Internal)

There are several lights which currently remain on all the time in areas such as the WCs 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 there are various refrigeration units such as fridges 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 Timers on Fuse Spurs to Water Heaters

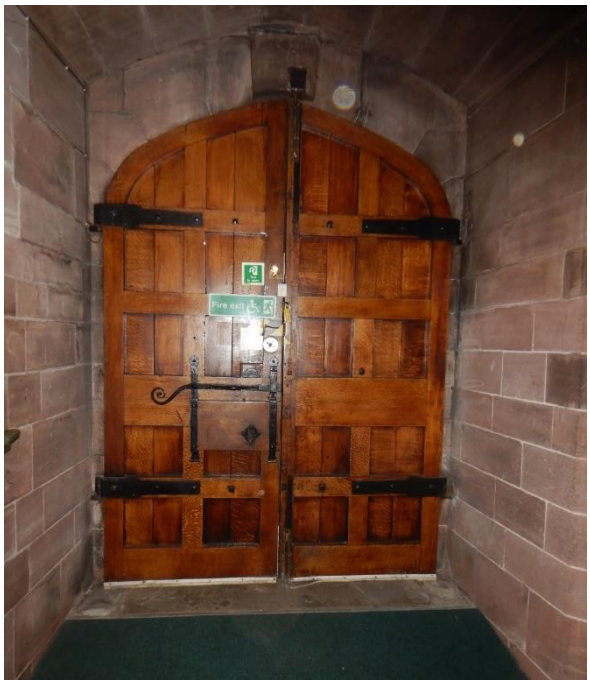
There are a number of electric point-of-use water heaters to provide hot water for hand washing. This only needs to heat the water to the required temperature when the building is in occupation but at the moment this heater is directly wired in without any form of time control and therefore maintains 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.

6.5 Draught Proof External Doors

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



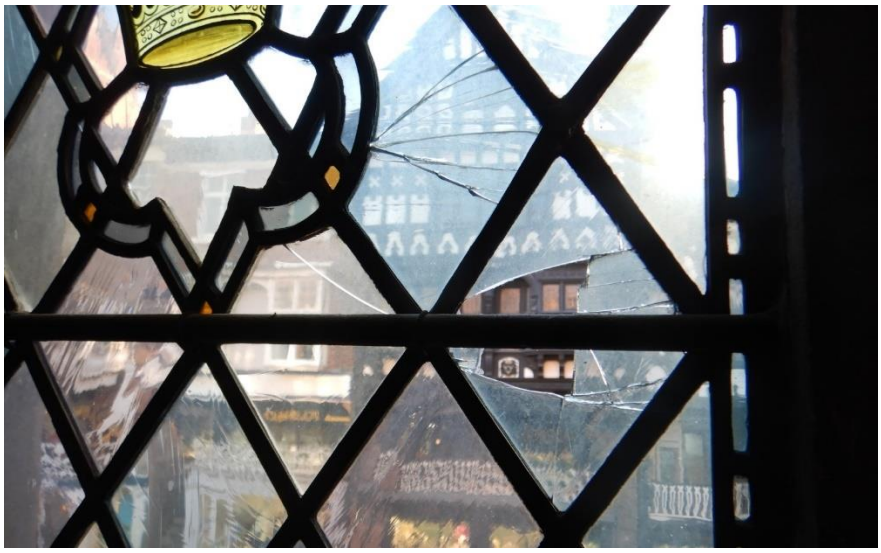
It is recommended that the draughtproofing around the door is improved and draught strips are added. This could be achieved in a number of ways:

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

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.

6.6 Replace Windows



The windows in the church are largely in a good state of repair but it was noted that there are a number of small glass panels that have been smashed through vandalism. As such it is currently very poor in terms of thermal quality and excessive cold air is being let into the space.

The repair of these windows would reduce the heat loss from the building and improve thermal comfort. This measure would not be costly and disruptive to install.

It is therefore recommended to replace this window, ideally with a secondary glazed window set into the existing surrounds. It is suggested that any window installation is undertaken by a FENSA Approved Installer www.fensa.org.uk

7. 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 - Could be done to centre and south aisle roof if structure allows. Access and deliveries would be difficult.
Battery Storage	No

Now that the Feed in Tariff scheme has come to an end the installation of solar PV panels in situations where there is not almost full usage of the electricity generated on site is not really viable.

There is potential for a small PV array on the roof of the tower or on the roof of the South Aisle. 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.

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. Funding Sources

There are a variety of charitable grants for churches undertaking works and a comprehensive list of available grants is available on this Parish Resources page:
https://www.parishresources.org.uk/resources-for-treasurers/funding/

9. 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.

10. 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 CO_2 out of the atmosphere. These either involve locking up ('sequestrating') CO_2 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
Nave chandeliers	5	LED GLS	£558	£238	0.43
South aisle	4	5ft Single LED	£159	£351	2.21
Vestry	4	LED GLS	£107	£48	0.44
Altar	3	LED GLS	£44	£36	0.80
North aisle	1	5ft Single LED	£94	£88	0.94
Gallery WC	2	2D LED 11W	£36	£118	3.23