ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

Rushmere: St Andrew
PCC of St Andrews

Author	Reviewer	Date	Version
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Contents

1. Executive Summary

An energy survey of Rushmere: St Andrew 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.

Rushmere: St Andrew is a Grade II* listed parish church which dates back to the 12th century but was reordered by Pace in the 1960's. The church also has a hall which was added in 1987. There is both gas and electricity supplied to the site although the church is heated by an oil boiler.

The church and church hall have a number of ways in which it can be more energy efficient. Our key recommendations have been summarised in the tables below and are described in more detail later in this report. It is recommended that these tables and the route to net zero carbon are used as the action plan for the church in implementing these recommendations over the coming years.

1.1 Church Recommendations

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)
Insulate exposed pipework and fittings in plantrooms	1,332	£133	£500	3.75	List A (None)	0.24
Change existing lighting for low energy lamps/fittings	1,124	£337	£1,558	4.62	Consult DAC	0.24
Refurbish window ironmongery / draught seals	1,017	£102	£500	4.92	Consult DAC	0.18
Install a Solar PV array to roof of building (assumed 100% of energy generated used in building)	4,317	£1,295	£6,475	5.00	Faculty	0.91
Add or replace draught strips to external doors	407	£41	£300	7.38	Consult DAC	0.07
Install PIR motion sensors on selected lighting circuits	70	£21	£161	7.69	List B	0.01
Install Variable Speed Drives (VSD) to pumps	271	£81	£800	9.84	List A (None)	0.06

Replace heating system for electrical based heating solution (electric under pew heaters and air to air source heat pumps)	12,511	£94	£40,270	429.18	List B	3.84
TOTAL	21,048	£2,104	£110,064			5.56

1.2 Church Hall Recommendations

Savings Recommendations	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated Capital Cost	Simple Payback (years)	Permission Needed	CO_2 saving (tonnes of CO_2e/year)
Change existing lighting for low energy lamps/fittings	3,726	£1,118	£1,274	1.14	Consult DAC	0.79
Install SavaWatt devices on fridges and freezers	140	£42	£50	1.19	List A (None)	0.03
Install PIR motion sensors on selected lighting circuits	150	£45	£170	3.79	List B	0.03
Replace heating system for electrical based heating solution (air to air source heat pumps)	2,431	£49	£6,900	141.92	List B	0.41
TOTAL	6,447	£1,253	£8,394			1.25

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

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

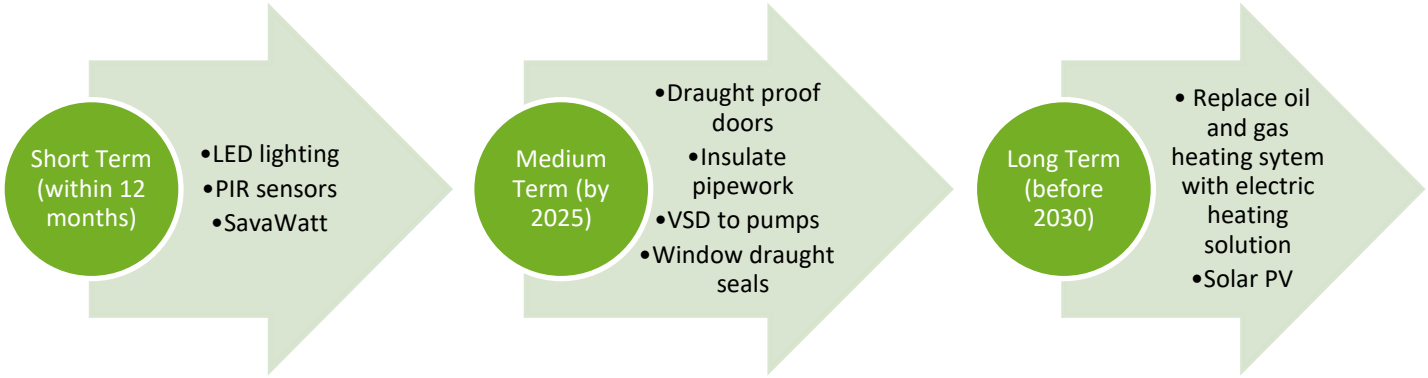
If all measures were implemented, this would save Rushmere: St Andrew £3,350 per year and reduce its carbon footprint by 6.8 tonnes (98%) in total.

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 Rushmere: St Andrew 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 Rushmere: St Andrew, The Street, Ipswich IP5 1DH, was completed on the 9th of November 2022 by Matt Fulford. Matt is a highly experienced energy auditor with over 15 years' experience in sustainability and energy matters in the built environment. He is a chartered surveyor with RICS and a CIBSE Low Carbon Energy Assessor. He is a Member of the DAC in the Diocese of Gloucester and advises hundreds of churches on energy matters.

Rushmere: St Andrew	
Church Code	633094
Gross Internal Floor Area	640 m^2
Listed Status	Grade II*

The church typically used for 77 hours per week for the following activities:

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Services	3 hours per week	65
Meetings and Church Groups	1 hours per week	
Community Use	12 hour per week	75

The church hall typically used for 95 hours per week for the following activities:

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Meetings and Groups	0 hours per week	
Community Use	95 hour per week	200

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

4. Energy Procurement Review

Energy bills for gas, oil, and electricity have been supplied by Rushmere: St Andrew and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	17.99p/kWh	Below current market rates
Night Rate	14.84p/kWh	Below current market rates
Standing Charge	27.83p/day	N/A

Supplier: Scottish Power

The current gas rates are:

Single / Blended Rate	3.30p/kWh	Below current market rates
Standing Charge	25p/day	N/A

Supplier: EDF

We would therefore recommend that the church obtains a quotation for its gas and electricity supplies from the Diocese Supported parish buying scheme, http://www.parishbuying.org.uk/energy-basket. This scheme only offers 100% renewable energy and therefore it is an important part of the process of making churches more sustainable.

A review has also been carried out of the taxation and other levies which are being applied to the bills. These are:

VAT	5%	The correct VAT rate is being applied
CCL	Not charged	The correct CCL rate is being applied.

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

5. Energy Usage Details

Rushmere: St Andrew church and church hall uses 6,300 kWh/year of electricity, costing in the region of £1,900 per year. The church uses 20,300 kWh/year of oil, costing £2,000, and the church hall uses 3,400 kWh/year of gas, costing £340. The total carbon emissions associated with this energy use are 7 CO_2e tonnes/year.

This data has been taken from the annual energy invoices provided by the suppliers of the site. Rushmere: St Andrew has one main electricity meter, serial number E11Z95662.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity	E11Z95662	3 phase 100A	Yes	Under stairs

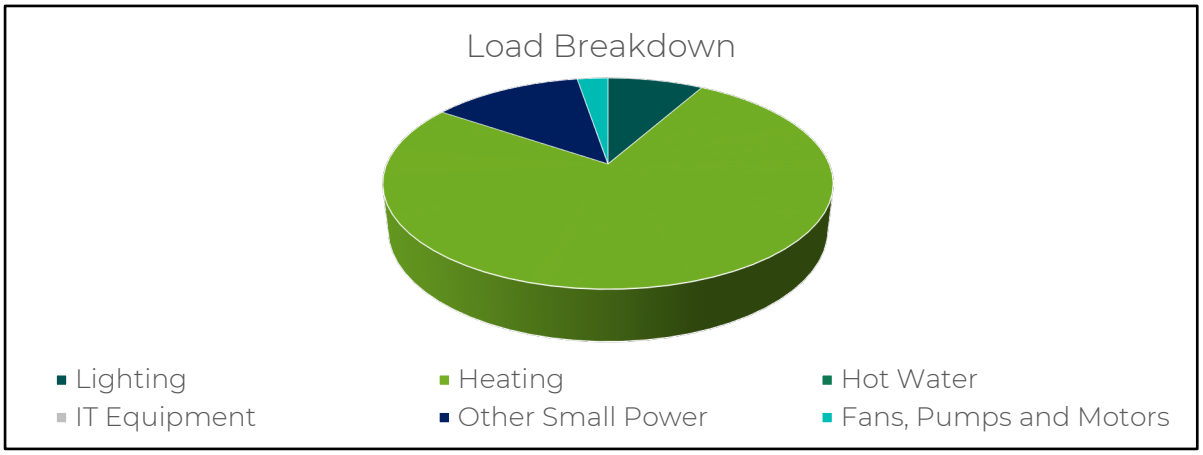
All the meters are AMR connected and as such energy profile for the entire energy usage should be possible. Half hour meter data has been provided for the purpose of this report and this has been used to verify the data.

5.1 Energy Profiling

Church

The main energy consuming plant can be summarised as follows:

Service	Estimated Proportion of Usage
Lighting	8%
Heating	76%
Hot Water	0%
Other Small Power	13%
Fans, pumps, and motors	3%

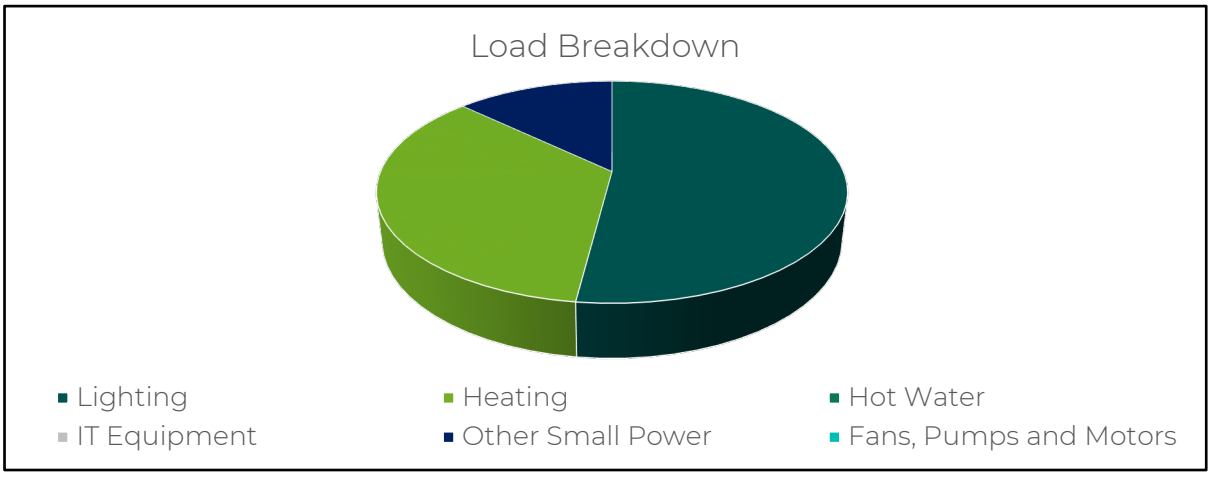


As can been seen from this data, the heating makes up by far the largest proportion of the energy usage on site. The other significant load is other small power.

Church Hall

The main energy consuming plant can be summarised as follows:

Service	Estimated Proportion of Usage
Lighting	52%
Heating	35%
Hot Water	0%
Other Small Power	13%
Fans, pumps, and motors	0%



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

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 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 existing oil boiler for the church is now well over 20 years old and can be considered to be at end of life. The direct gas heaters may have some serviceable life left within them but are likely to require replacement in the next 5-10 years.

Within the church the various options for decarbonised heating have been reviewed and are shown in the table below:

Decarbonised Heating Viability	Feasible?	Notes:
Air to Water Source Heat Pump	No	Unsuited to current heating pipework and heat emitters
Air to Air Source Heat Pump	Yes	Suitable for un-pewed area (at Pace end)
Water Source Heat Pump	No	No water source locally
Ground Source Heat Pump	No	Significant archaeology
Under Pew Electric Heating Panels	Yes	Suitable for pewed end of the church
Electric Panel Heaters (to provide supplemental heating only)	Yes	Can be used to WCs etc.
Over door air heater (to provide supplemental heat only to provide a warm welcome at the door)	Yes	Possible over main south door
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 most viable and effective decarbonised heating strategy is likely to be to use electric under pew heating in the section of the church fitted with pews, and air to air source heat pumps in the new end of the church and the hall.

Therefore, the following recommendations for the church and church hall should be considered.

6.1 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.

This type of system would work well to the open plan areas to the chaired areas of the church and also to the hall.

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.

The floor mounted units would fit in well with the buildings aesthetics.

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

6.2 Install Electric Under Pew Heaters

Electric under pew heaters provide a high level of thermal comfort to people sat in the pews. They are not installed to try and heat the entire air volume of the church, instead thermal comfort is achieved through a flow of warm air rising past the person in the pew. This means that the heaters should be installed under the entire length of all the pews that are likely to be used.

These heaters warm up almost instantly and a flow of warm air over the pew area is created within around 15 minutes of their being turned on. This significantly reduces the amount of preheating required before each use of the building and can make electric heating cost competitive with gas. It is important that this reduced 'on time' is properly reflected in any comparisons with other types of heating. 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.

We would therefore suggest that the following works could be considered:

Area	Type/ Size	Length (mm)	Watts	Area Heated	Number required
Nave	Electric Under Pew 450W	702	450	Pew Only	20
Nave	Electric Under Pew 650W	948	650	Pew Only	20

Cable runs to the pew heaters should run along the along the existing routes (all cabling should be in armoured cable or FP200 Gold when above ground) to both rows of pews. Each pew heater to be switched with a neon indicated fused spur located underneath the pew seat.

The under pew (see photo below) and panel heaters have been recently installed at St Andrews Church, Chedworth, Gloucestershire, GL54 4AJ. The church is open in daylight hours so can be viewed at any time.

Brown BN Thermic 650W under pew heaters fixed to underside of pew seats for pews which have no solid backs.

6.3 Install Electric Panel Heaters

Electric panel heaters can provide additional heating to areas where there are no pews. Suitable electric panel heaters would be far-infrared panels. 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 a specific space and only need to be on for short periods of time. The heating effect spreads out from the panel by up to 3 meters, although this is reduced by people and furniture. This means that these heaters provide a useful source of supplementary heating or primary heating for some well-defined areas but are not very well suited to providing a complete heating solution for a church without other forms of heating (such as under pew). As these heaters warm up almost instantly, 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 areas using this form of heating can rapidly and economically be brought into used for short or unplanned meetings if needed.

It is recommended that the PCC consider installing electrical panel heaters in the area specified in the table below and remove the existing radiators.

Area	Type/ Size	Length (mm)	Watts	Area Heated	Number (or m) required
Church WCs	Electric Far IR Wall Panel 350W	600	350	4-7 m2	2

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.

Example of an electric panel heater installed behind an altar in another church.

7. Energy Saving Recommendations

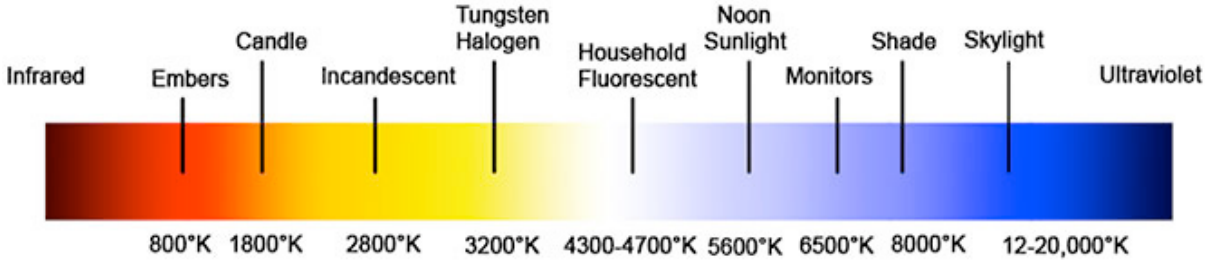
In addition to having a revise heating strategy there are also a number of other measures that can be taken to reduce the amount of energy used within the church.

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 a large number of inefficient fittings within the WCs, the area of the church without pews, the external lighting, and the 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/

Having reviewed the external church flood lighting it is recommended that new units with a colour rendering of 3000K are installed. This is a warm enough light that will provide a pleasant illumination of the building without being too harsh. The colour output of lights are often described in word terms such as “warm white”, “cool white” etc but these can vary between manufacturers. It is better to specify the lights on the colour kelvin index. The range of this scale is shown below and a light output at around 3000K would remain a pleasantly warm appearance and floodlighting with units of 6000K should be avoid.



If all the lights throughout the church and church hall were changed on a simple “like for like” the total capital cost (supplied and fitted) would be £2,830. The annual cost saving would be £1,460 resulting in a payback of around 2 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/

7.2 Lighting Controls

The external lighting to the church and the tower currently remain on all the time overnight. This was reported to be for security reasons as well as to advertise the presence of the church in the community.

Having reviewed the lighting on during hours of darkness it was noted that the external lighting does very little to provide security lighting and allows people to find and lurk in shadows should they wish.

It is highly recommended the wall mounted lighting on the walls of the church are fitted with motion sensors 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.

The external flood lighting should be operating on a timeclock that would turn the units on at dusk but turn off at around 10pm. This will illuminate the church but will turn off late at night not to cause light pollution.

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 Insulation of Pipework and Fittings

The pipework within the boiler room has the majority of its straight lengths insulated, but the more complex shaped pipework fittings, such as 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 9309689, adrian@esos-energy.com).

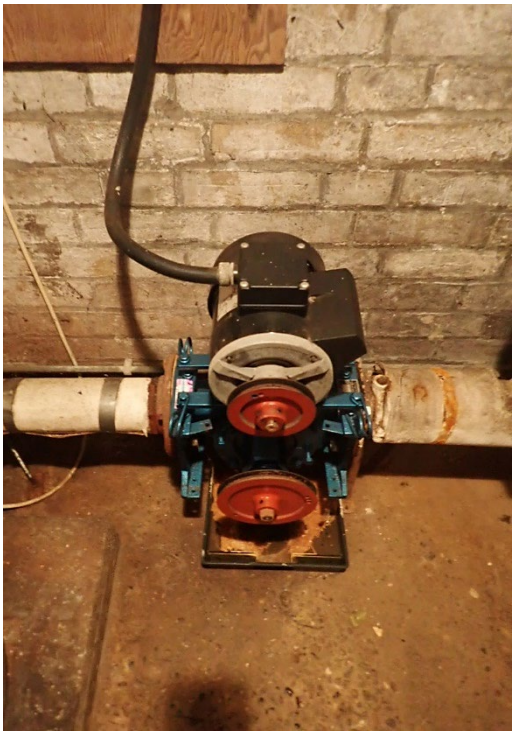
7.4 Refrigeration Controls

Within the hall there are 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, if compatible. 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 can be undertaken by SavaWatt directly; information is at 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.

7.5 Variable Speed Pumps



The existing pumps within the church are fixed speed units meaning that they are either running at full power or they are off. In varying conditions, the pumps will only need to operate at part power and can consume less energy in doing so.

It is recommended that the pumps are changed to variable speed drive units which can automatically vary the power they use depending on the conditions at that particular moment in time, for example, how much heat is required into the heating system.

The installation of variable speed units will require the removal of the existing pump and the installation of a new unit with integration back into the controls system. As such this should be carried out by a competent mechanical engineer.

7.6 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 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.

7.7 Replace Window Seals

The windows in the church are single glazed stained or leaded windows. Due to their age the seals within these have become compressed and no longer always create an air-tight seal when closed. Some of the ironmongery has also worn preventing the windows from shutting tight in the frame.

It is recommended that the old seals are removed and replaced with new seals of the same profile. These are widely available from on-line suppliers such as www.sealsdirect.co.uk/. Ironmongery should also be checked and replaced or repair where required.

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 – to newer end of church
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

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 newer end of the church. 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.

Wind turbines require highly exposed sites and should be located 250m way from buildings as such this site is not suitable for a wind turbine to be installed.

Hydro electricity is a highly efficient source of renewable energy but requires a body of flowing water with a differential height which is not present on this site.

Solar thermal installations are best suited to heat water for use in washing up, hand washing and bathing. There is minimal hot water demand at this church so such an installation would not be viable.

Heat Pumps are a low carbon method of creating heat, there use and suitability for this church have been review in the section earlier on in this report on Efficient and Low Carbon Heating Strategies.

Biomass is an alternative boiler and fuel to oil or gas. It requires wood chips or pellets to be delivered on site, stored, and then fed into a large boiler for burning. While the fuel is not a fossil fuel there are emissions from the burning of wood, and these can be detrimental to local air quality particularly in more built up areas for all these reasons it is not considered a viable recommendation for this site.

9. 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/

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 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

11.1 Church Lighting

Room/Location	Number of fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
WCs	4	2D LED 11W	£25	£251	9.90
Area without pews	11	2D LED 11W	£70	£647	9.27
Externals (wall mounted)	4	LED GLS	£61	£48	0.79
Externals (3000K flood)	2	100W LED Flood	£182	£400	2.20

11.2 Church Hall Lighting

Room/Location	Number of fittings	Recommended Upgrade	Annual Saving (£)	Total Cost (£)	Payback
Entrance	3	2D LED 11W	£96	£192	2.01
WCs	2	2D LED 11W	£75	£118	1.56
Hall	9	5ft Single LED	£947	£790	0.83