ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

St George's Church Hall, Bickley
PCC of St George's Church

Author	Reviewer	Date	Version
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Contents

1. Executive Summary

An energy survey of St George's Church Hall, Bickley was undertaken by ESOS Energy to provide advice to the PCC on how it can be more energy efficient and provide a sustainable and comfortable environment to support its continued use.

St George's Church Hall, Bickley consists of a Grade II listed Victorian church hall built in 1864 adjoined by larger 1964 hall, kitchen and office. There is both gas and electricity supplied to the site.

The hall has a number of ways in which is 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 is used as the action plan for the PCC 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)
Purchase a temperature and humidity datalogger, and optimise heating start and stop times	5% 1,650	£34	£50	1.5	None	0.3
Clean and flush heating system	10% 3,300	£68	£250		List A	0.6
Install Endotherm heat transfer fluid	10% 3,300	£68	£140	2	None	0.6
Change any remaining lighting to LED					None	
Draughtproofing opportunities	5% 1,650	£34	£50	<2	None	0.3
Install Cavity Wall Insulation (1964 hall)	10% 3,300	£68	£3,000	long	Faculty	0.6
Install insulation above 1864 hall ceiling (only if it is to be in regular use)	1-2%	£7	£1,500	long	Faculty	Minimal due to low use of room
Install an Air Source Heat Pump to feed radiators	33,000 gas Use 13,200 electric	£1,060 gas Add £1,663 electric if from grid only	15,000	Not recovered except with solar power	Faculty	6
OR						
Install Infra-red radiant heating panels to replace	33,000 gas Use 18,900 electric	£1,060 gas Add £2,381 electric if	£8,000	Not recovered except with solar power	Faculty	6

entire heating system		from grid only				
Install Solar Photovoltaic panels on roof of 1964 hall	Generate 20,000	Save £2,520	£28,800	11.5	Faculty	0.3

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

Based on current contracted prices of 12.5991p/kWh and 2.0759p/kWh for electricity and mains gas respectively.

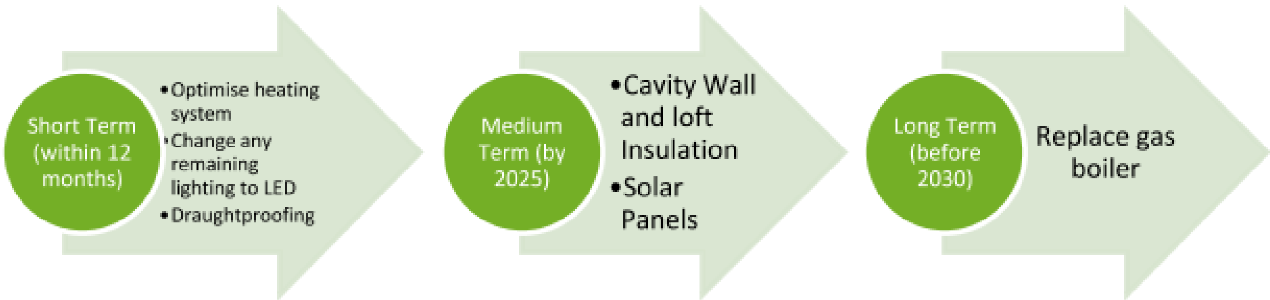
If all measures were implemented this would save the church around £2,600 in operating costs per year.

2. The Route to Net Zero Carbon

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

The current carbon footprint of the hall is estimated to be zero CO_2 from 11,750kWh of electricity use (procurement of 100% renewable electricity otherwise 3.0t) plus 6.0t of CO_2 from 33,000kWh of gas use.

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



3. Introduction

This report is provided to the PCC of St George's Church Hall, Bickley to provide them with advice and guidance as to how the hall can be improved to be more energy efficient. In doing so the hall will also become more cost effective to run. Where future hall development plans are known, the recommendations in this report have been aligned with them.

An energy survey of the St George's Church Hall, Bickley Park Road was completed on the 14th September 2020 by Paul Hamley. Access to the majority of the 1964 was not possible as a nursery was in session during the time of the audit. The 1864 hall, corridor and ancillary rooms were surveyed and external measurements taken, with subsequent photographs provided by Graham Callow.

Paul is an energy auditor with experience of advising churches and small businesses. He is part of the Diocesan Environment Officers Energy Group developing advice for the Church of England and authored the "Assessing Energy Use in Churches" report for Historic England. He is a CIBSE Associate member and a Chartered Scientist, with experience of the faculty process gained from chairing the building committee of a Grade I listed church and has been an EcoChurch assessor.

St George's Church Hall, Bickley	
Church Code	621017
Gross Internal Floor Area	350 m2
Listed Status	1864 hall - Grade II 1964 hall - unlisted

The hall is currently used for around 55 hours per week for the following activities, not including the current nursery booking.

Type of Use	Hours Per Week (Typical)	Average Number of Attendees
Small Hall Church use (mostly)	1-3	10
Large Hall Community Use	55	250 daily

Summing the data discussed gives the following figures:

Annual building Occupancy Hours: 2900

Annual Footfall: 65,000

Annual Heating Hours: 2100

4. Energy Procurement Review

Energy bills for gas and electricity have been supplied for St George's Church Hall, Bickley and have been reviewed against the current market rates for energy.

The current electricity rates are:

Single / Blended Rate	12.5991p/kWh	Below current market rates
Standing Charge	39.0716p/day	N/A

The current gas rates are:

Single / Blended Rate	2.0759p/kWh	Below current market rates
Standing Charge	394p/day	N/A

The church hall obtains its gas and electricity supplies from the diocese supported Parish Buying scheme which offers 100% renewable energy. This means that the church halls's carbon footprint from electricity is zero.

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

VAT	5% current	20% was charged by the previous supplier between January and May, and October-November 2019. It is believed that this has been recovered.
CCL	not charged	The correct CCL rate is being applied currently. CCL was charged during the above period.

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

5. Energy Usage Details

St George's Church Hall, Bickley uses around 11,750 kWh/year of electricity, costing in the region of £1,600 per year. The gas use is shared with the church as described in Section 5.1; annual use by the hall is estimated to be 33,000kWh, costing £685.

This data has been taken from the annual energy invoices provided by the suppliers of the site. The main gas meter serving the site is located externally. A gas meter is also located on the wall of the 1864 hall which appears to be connected to the gas pipe serving the church boiler – this meter may be obsolete.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Hall	E12Z041645	EDMI Atlas Mk10D	Yes	1964 hall stage gantry
Gas – Church & Hall	M040 K00351 16 D6	BK - 625M	Yes	External gas meter cupboard, NW corner of car park

All the meters are AMR connected and as such energy profile for the entire energy usage should be possible to obtain from the supplier.

5.1 Church and Hall Gas use Estimation

One gas meter is thought to supply the site. The meter in the 1864 hall does not appear to be in use. An estimate has been made based on boiler size and reported hours of use for church and hall.

It is further assumed that (a) the church boiler is normally working at full power, heating a large space up from cool temperatures several times per week. 25h/week x 40 weeks

(b) the hall boiler is in use during the heating season when the building is open, 55 hours per week building use means the boiler may be operating for 8 or more hours on several days: it will not be at full power once the set temperature is reached. It is assumed the average is 1/3 power.

60h/week x 35 weeks

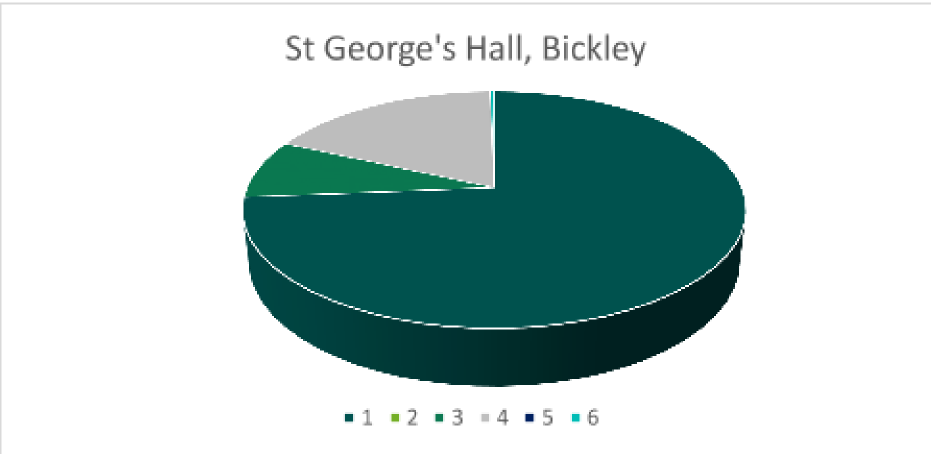
Building	Boiler Power/kW	Building use hours Per week	Building use hours annually	Heat hours annually	Annual use kWh
Church	115	21	1100	1000	115,000
Hall	46	55	2860	2100	33,000
Total					148,000

5.2 Energy Profiling

The main energy use within the church hall can be summarised as follows, with estimated consumptions:

Service	Description	Estimated Usage
Gas Heating	46kW boiler, 2100 hours, partial load	33,000
Hot water	Water heater, 3kW, 2 hours per day Kettle Coffee machine Cooker (6 uses annually) Microwave	2000 300 300 100 12
Lighting	1964 Hall, 20 F58 tubes, 58W Fluorescent tubes in main rooms, low energy bulbs assumed elsewhere	6000
Other Small Power	Office - photocopier	50
Total measured	Electric Total	11,750 44,750

Electricity use sums to 8762kWh, a shortfall of around 3000kWh. Greater use of the kitchen water heater, lighting hours, or the presence of non low energy lighting would explain this. The hall is fitted with stage lighting – if this is not recently installed, and it is used it would account for a considerable amount of electricity with 250W bulbs.



KEY 1 Gas Heating 2 Electric Heating (zero) 3 Hot Water
4 Lighting (including External Lighting 5) 6 Small Power

Heating makes up by far the largest proportion of the energy usage on site. The other significant load is lighting.

6. Energy Saving Recommendations – Building Fabric

There is potential to save around 15% of gas use through insulation and draught proofing.

6.1 Draught Proof External Doors

Draughts can enter the building continuously, small draughts may be responsible for 5% of the total heating bill.

It is recommended that the draughtproofing around external doors is improved where possible. This could be achieved in a number of ways.

For timber doors that close onto a timber frame, it is recommended that draught proofing is fitted to all external doors. 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

For little used doors simple measures such as placing a 'sausage dog' draught excluder at the base of the door and/or using a fridge magnet painted black over the keyhole can be quite effective.

6.2 1864 Hall

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

The ceiling/roof of a building is the largest contributing area to heat loss from a building as heat rises. 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.

Ceiling insulation could be installed in the void above the ceiling.

This is only cost effective if this hall is to be used, and heated regularly. A few hours use per day will not justify the expense.

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).

6.3 Opening Windows

Hopper windows are often a cause of drafts as they rarely close in an air tight manner. Small and medium gaps can be easily filled with black plasticene which can be easily removed. Any distorted or corroded frames should be professionally repaired as a priority as they will lead to water ingress and further deterioration.

6.4 Cavity Wall Insulation

The hall is constructed with a cavity wall method as can be seen from the brickwork pattern and upon inspection of the wall no evidence could be seen that Cavity Wall Insulation has been fitted. (This should be checked with your Inspecting Architect). CWI will be cost effective to fit to a building in regular use.

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).

7. Energy Saving Recommendations - Electricity

7.1 Lighting (fittings)

The lighting makes up a relatively large proportion of the electricity used within the hall.

The majority of the lighting is provided using fluorescent tubes. When these are due for replacement they can be replaced by LED strip lights of even lower energy.

If the stage lighting is to be used regularly, the bulbs should be changed for low energy LED equivalents.

7.2 Install PIR motion and daylight sensors on selected lighting circuits

It is recommended that a motion sensor is installed on specific lighting circuits for the kitchen, toilets and corridor areas 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.

8. Energy Saving Recommendations – Current Heating System

There is potential to save 25% of gas use through optimisation of heating times, system cleaning and installation of additives.

8.1 Heating System Overview

A Vaillant Eco Tec VU GB 466/4-5 46kW condensing boiler is fitted.

8.2 Clean / Flush Existing Heating System

It is strongly recommended that the heating system is cleaned to remove sludge from the system, this is done by using a chemical clean and/or power flush procedure where cleaning chemicals are put into the system which is then turned on and run through a filter consisting of high power magnetics to remove the sludge.

The cleaning of a heating system can be carried out by any competent heating engineer and typically increases the efficiency of a system by between 10 to 15%. This can dramatically reduce gas use and carbon footprint.

8.3 Magnetic Particle Filter

Fitted – this should be cleaned out annually when the boiler is inspected.

8.4 Endotherm Advanced Fluid

In order to improve the efficiency of the heating system further it is recommended that an advanced heating fluid (http://www.endotherm.co.uk/) is added to the heating system.

This fluid in in addition to, and complements any existing inhibitors in the heating system and is added in a similar way. The fluid works to improve the ability of the boiler to transfer heat into the heating system and for the radiators and other heating elements to give out their heat into the rooms. It does this by reducing the surface tension of the water and increasing its capacity to transfer and hold heat. Case studies have demonstrated that the addition of this fluid into heating systems reduces heating energy consumptions by over 10% as well as helping the building heat up quicker.

Endotherm can be self-installed.

8.5 Controls

The hall heating is controlled by a controller located in the boiler room.

It is recommended that a Temperature and humidity datalogger is purchased. This will allow for optimum heating start and finish times to be determined for both church and hall. The device, like a large data key, will record data (from hours to months); this can be used to view a temperature/ time graph which shows heating rate and temperature reached.

Opportunities for saving can arise from:

- Turning on the heating so the set temperature is reached as people arrive, not before (it can be measured using the temperature datalogger).
- Turning the heating off 45 minutes before people leave, so the radiators will be cooling at that point.
- Adjusting the thermostat so that the heating does not exceed 20°C.
- Adjusting the feed and return temperatures so that the latter is below 55°C, and the boiler can run efficiently in condensing mode (place the datalogger on the return pipe).

An example of a suitable datalogger can be found here. There are a number of similar products on the market: https://www.lascarelectronics.com/easylog-el-usb-2

8.6 Thermostat location

The thermostat is located in the boiler room. The boiler has an open vent under it, so the thermostat will be considerably colder than the rest of the hall. It is in a suitable location for frost protection, but it will not record temperature rise and fall elsewhere. A datalogger record of the actual temperatures reached can help set the thermostat.

8.7 Reflective Radiator Panels

The hall is heated by radiators served from the boiler. These radiators are located on the external, uninsulated walls and have no reflective or insulated surfaces directly behind them at present. They therefore lose much of their heat into the masonry of the wall behind the radiator rather than give out the heat into the body of the hall.

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

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

When the building is in use, furniture should not be stacked in front of radiators; it will absorb the radiated heat.

9. Efficient / Low Carbon Heating Strategy

9.1 Background

The energy used for heating a building such as the hall typically makes up around 90% of the overall energy consumption. Heating often uses gas or oil as the primary fuel, fossil fuels with high carbon emissions and little opportunity to decarbonise in the future. Electricity currently has carbon emissions around the same level as mains gas but the carbon emissions associated with electricity are reducing rapidly as the UK builds more renewable energy and decommissions the few remaining 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'. Churches whose suppliers include a portion of bio gas typically have a reduction by around 20% of the gas carbon footprint.

The General Synod of the Church of England recently voted to put the church on the path to net zero carbon emissions by 2030. This is a deliberately bold step, aimed at encouraging churches to lead the way and set an example to society, viewing creation care and the fifth mark of mission as an important focus for effort and expenditure.

It is therefore important to set out a plan to make the future heating system more efficient and less carbon intensive. The PCC should develop a boiler replacement plan, as it will not last for ever. This report outlines options. One way to achieve this is to consider a transition to electrical heating where this also represents a more efficient and comfortable solution for churches.

The ideal solution would be one where the source of heat is carbon neutral – this could be electricity obtained from a fully renewable supplier, or possibly in the future, "green" gas from a mix of anaerobic digestion (of agricultural and food waste) and hydrogen [Parish Buying currently procures 20% gas from anaerobic digestion]. Adding hydrogen to the current mains gas can only be done up to a limit of around 20%, beyond which conversion of existing equipment will be required – in a similar way to which appliances nationwide were converted from town gas to North Sea gas in the 1970s. A changeover would be led by government working with the supply industry. A pilot scheme is underway, but it is very uncertain how much hydrogen will be produced, how and when. Achieving carbon neutral gas may take several decades.

9.2 Recommendations

St George's church hall has a weekly use of around 55 hours, relatively old radiators and a boiler which will probably require replacement within the next decade.

Options include:

- Keep the radiator network, replace the boiler with a heat pump
  [This would incur greater operating costs with the same level of heating input; but if the electricity is generated on site this drawback is removed]

- Replace all radiators with far infrared panel heaters.

- Install solar photovoltaic panels are installed on the hall roof, which will reduce operating costs for both electrical heating methods.

10. Boiler Replacement Option Details

The current boiler is thought to be at least 7 years old; thus, it is at the age where repairs or replacement can be anticipated to be needed during the next decade. Options for boiler replacement should be explored by the church and hall, bearing in mind the General Synod's decision for the Church of England to aim at net zero carbon emissions by 2030.

10.1 Retention of wet radiator system – install an Air Source Heat Pump

Electricity is used to extract and upgrade heat from the air using refrigeration technology. Air Source Heat Pumps [ASHPs] require a good air supply; so are usually located on roofs. The church hall has a large flat roof which offers a suitable location.

ASHPs work most efficiently providing warm water constantly / semi constantly (and most efficiently when the air is warmest). The daily use pattern of the hall means that a heat pump could be envisaged as working regularly to maintain the temperature.

Installation Cost Estimate (40kW delivered) = £26,000

Approximate Operating costs [Assuming current 2100 hours of use]:

Assuming an average coefficient of Performance of 2.5

Present Electricity requirement = 33,000kWh/2.5 = 13,200kWh (may be reduced with efficiencies)

Annual Cost (at present prices) = £1,663

10.2 Retention of wet radiator system – Ground Source Heat Pump

Ground Source Heat Pumps [GSHP] require less electricity to deliver the same heat as ASHPs over the long term, because the average ground temperature in the UK is higher than the average air temperature. The average Coefficient of Performance is around 3.5 rather than 2.5. This indicates how many kW of heat are produced for each kW of electricity. Installation costs are considerably higher than for ASHPs. Normally, churches with graveyards are unable to install the necessary underground coils required (which also require a large area to heat a large building). A borehole system may be feasible.

GSHP installation incurs higher costs than ASHP.

Installation Cost Estimate (40kW delivered) = £40,000

Approximate Operating costs [Assuming current 2100 hours of use]:

Assuming an average coefficient of Performance of 3.5

Electricity requirement = 33,000kWh/3.5 = 9,430kWh (may be reduced with efficiencies)

Annual Cost (at present prices) = £1,188

10.3 Underfloor Heating

This should only be considered for a building whose use is over 50 hours per week, regularly use on most days. Underfloor systems take a long time to heat up (over a day) and deliver low grade heat over the area installed, which then gradually warms the surrounding fabric. They cannot deliver "on demand" heat and are extremely expensive to install, so should only be considered by churches who are able to guarantee regular daily use of their premises.

For St George's church hall, underfloor heating could be installed for the main hall, but the expense would be better spent on solar panels and a heat pump.

10.4 Electric Panel Heating

Far infra-red radiant panel heaters are a replacement for space heating by convector radiators.

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). As such these heaters tend to provide a relative 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 be brought into use, economically, for short or unplanned meetings.

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.

Estimate of total heat input required for 185m^2 large hall: using 900W panels, installed cost £559 each. Ten panels, 9kW, £5,590, add smaller panels for corridors, office and toilets; £8,000.

Panels could be installed either at low level in place of the existing radiators, or higher on the walls. Some manufacturers manufacture panels with printed artwork, and a heated mirror panel is available.

11. Renewable Energy Potential

The potential for generation of renewable energy on site has been reviewed and the viability noted.

Renewable Energy Type	Viable
Solar PV	Yes
Battery Storage	Yes
Wind	No – no suitable land away from buildings
Micro-Hydro	No – no water course
Solar Thermal	No – insufficient hot water need
Ground Source Heat Pump	Possibly, dependent on economics
Air Source Heat Pump	Yes
Biomass	No –maintenance and air quality issues

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.

11.1 Solar Photovoltaic Panels

The flat roof of the hall has an area of 190m^2. This gives a usable area of 160m^2 allowing for walkways. This will allow a system generating a peak output of around 24kW. Generation in the order of 20-22,000kWh per year is likely; orienting the panels at 35^o from horizontal gives the best output but requires extra expenditure for the support structures. This is around double the current use of the hall but could supply the church also. If a move is made to electric heating this extra supply will be required.

It will be necessary to calculate the total weight of the assembly and for a structural engineer to confirm that the roof structure is able to support the extra load.

At a cost of £1,200 per kWpeak (plus supports for angling at 35°) gives an estimate of around £30,000. This does not include cost of any battery.

Installation of a battery will extend the usefulness of the system and allow for less energy drawn from the grid at night and during the winter.

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 therefore investment into this may be worth delaying at this stage.

Sources: Tables H3 & H4, SAP 2009, http://www.bre.co.uk/filelibrary/SAP/2009/SAp-2009_9-90.pdf

https://www.theecoexperts.co.uk/solar-panels/cost

https://www.exeoenergy.co.uk/solar-panels/solar-panel-output/#uk_rule_of_thumb

12. Other Recommendations

12.1 Electric Vehicle Charging Points

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

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 church to be able to sell tokens or have a coin operated device that would at least cover the costs of the electricity use and could make a small income. As the hall is a place of work for the pre-school users it may be able to benefit from a grant to part cover the installation costs of a charger from https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers

12.2 Other Issues

Extensive woodworm activity was suspected in the doors of cupboards in the 1864 hall from the evidence of dust nearby. This issue should be mentioned to the DAC and your Inspecting Architect who may be able to direct you to appropriate professional advice.

13. 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 .

14. Faculty Requirements

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

Throughout this report we have indicated our view on what category of permission may be needed to undertake the work. This is for guidance only and must be checked prior to proceeding as views of different DACs can differ.

Under the new faculty rules;

List A is for more minor work which can be undertaken without the need for consultation and would include changing of light bulbs within existing fittings, repair and maintenance works to heating and electrical systems and repairs to the building which do not affect the historic fabric.

List B is for works which can be undertaken without a faculty but must be consulted on with permission sought from the Archdeacon through the DAC. This includes works of adaptation (but not substantial addition or replacement) of heating and electrical systems and also the replacement of existing boilers so long at the same pipe work, fuel source and flues are used. It can also be used to replace heating controls.

All other works will be subject to a full faculty.

Works which affect the external appearance of the church will also require planning permission (but not listed building consent) from the local authority and this will be required for items such as PV installations.