Energy Audit and Survey Report

St Agnes' Church and Hall, Reading

"There is a plan to reduce global carbon emissions to net zero by 2050. The plan will work. It involves all of us. We need to begin now, in our homes and workplaces and churches"

Revd Dr Stephen Croft, Bishop of Oxford

Version Control

Author	Reviewer	Date	Version
Paul Hamley	Matt Fulford	31st December 2019	1.0

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1. Executive Summary

An energy survey of St Agnes' Church, Reading was undertaken by Inspired Efficiency Ltd 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.

St Agnes' Church, Reading is constructed of brick and built in 1938. There is both gas and electricity supplied to the site.

The church 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 church in implementing these recommendations over the coming years.

Short Term: Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Simple Payback (years)	Permission needed	To be actioned by who / when?
Draughtproofing of external door into transept	1,350	£50	£40	1	List A/B	Warden/ Property Maintenance
Fit Thermostatic Radiator Valves	3,000	£2,000	£110	18	List B	Warden/ Property Maintenance
Obtain a temperature datalogger to optimise heating	3,360	£125	£40	<1	None	Warden/ Property Maintenance
Add automatic off switch to toilet lights	100	£12	£30	3	None	Warden/ Property Maintenance
Replace the T12 fluorescent tubes in the church and any remaining halogen and incandescent light bulbs in hall	103	£13	£125	17	None	Warden/ Property Maintenance

Medium Term: Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Simple Payback (years)	Permission needed	To be actioned by who / when?
Air Source Heat Pump for hall	45000 gas replacement [2/3 of 67200kWh]	N/A (switch from gas to elec)	£15,000	-	Faculty	PCC
Solar PV panels on hall roof	4500+	£980	£14,500	14	Faculty	PCC

Solar PV would provide free electricity to run a heat pump. See section 11.1 for cost estimation.

Long Term: Energy saving recommendation	Estimated Annual Energy Saving (kWh)	Estimated Annual Cost Saving (£)	Estimated capital cost (£)	Simple Payback (years)	Permission needed	To be actioned by who / when?
Insulate roof	Limited, as an intermittently heated church	-	-	-	Faculty	PCC

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

Based on current contracted prices of 12.312p/kWh and 3.697p/kWh for electricity and mains gas respectively.

If all measures were implemented this would save the church over £1,000 in operating costs per year.

2. Introduction

This report is provided to the PCC of St Agnes' Church, Reading to provide them with 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 Agnes' Church, Reading, Northumberland Avenue RG2 8DD, was completed on the 5th November 2019 by Paul Hamley. 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.

St Agnes' Church, Reading	627475
Gross Internal Floor Area	Church 350m^2 Hall 230m^2 Total 580m^2
Listed Status	Unlisted
Typical Congregation Size	60

The church is typically used for 8 hours per week for the following activities

Services	3.5 hours per week 1000-1200 1130-1300
Meetings and Church Groups	1000-1100 Wednesday Friday evening music group, 3h
Community Use	6 concerts p.a.

Church annual use = 416 hours

The adjacent hall is heavily used by several groups, estimated at 40 hours per week.

Heating hours: Church = 600 hours, Hall = 1770 hours.

Estimated footfall (church only) = 7700 people

3. Energy Procurement Review

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

The current electricity rates are:

Single / Blended Rate	12.312p/kWh	Below current market rates
Standing Charge	20.88p/day	N/A

The electricity contract with SSE was terminating on 30th November 2019.

The current gas rates are:

Single / Blended Rate	3.697p/kWh	Slightly above current market rates
Standing Charge	223.67p/day	Above current market rates

The contract with British Gas is charged at a higher rate than Parish Buying, with a very high standing charge.

The above review has highlighted that there are opportunities to gain cost savings from improved procurement of the gas supplies at this site. We would therefore recommend that the church obtains a quotation for its gas supply from the Diocese Supported parish buying scheme, http://www.parishbuying.org.uk/energy-basket. This scheme only offers 100% renewable energy sourced 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.

4. Energy Usage Details

4.1 Annual Consumption

St Agnes' Church, Reading uses in the region of 4,500 kWh/year of electricity, costing £700 per year, and approximately 67,000kWh/year of gas, costing in the region of £3,300.

This data has been taken from one summer quarterly electricity bill – use has been assumed to be roughly constant over the year. Gas figures have been estimated from ten months data; November 2018 until August 2019. However, there are two rates charged per kWh and four standing charge rates over this period; and the gas meter supplies both church and the adjacent hall. Annotations on the gas bill indicate a 50/50 split.

St Agnes' Church, Reading has one main electricity meter. There is one gas meter serving the site.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	S75C15922	Smart		Kitchen
Gas – Church and Hall	M016 A04381 15 A6		no	Cabinet near site boundary, south of hall.

It is recommended that the church consider asking their suppliers to install a smart gas meter with a sub meter for the hall boiler so that the usage can be monitored more closely and the patterns of usage reviewed against the times the building is used.

4.2 Energy Profiling

The main energy use within the church can be summarised as follows:

Service	Description	Power	Annual Use/ kWh	Estimated Proportion of Usage %
Gas heating (Church)	Stelrad Ideal Concord CX boiler Use estimated from utility bill 600 Heating hours	**112kW**	67,200	
Gas heating *(Hall)*	Potterton Kingfisher 2 RS100 1770 Heating hours (8h per day x 220 days)	**38kW**	*67,200*	
Boiler pumps	Church – Grundfos (600h) *Hall (1770h)*	200W 100W	120 *177*	
Lighting Church (600hours)	All lighting has been replaced by LED bulbs or CFLs; no incandescent bulbs remain. Spotlights –**6 x 15W LED** Centre – 5 pairs Cloister – 6 Various spotlights LED total 2 fluorescent tubes T12, 5'long @80W each Annual use 600 hours	 400W 160W	 336	

Hall **Foyer** **Kitchen** **Toilets** (1770hours)	Assumes low energy bulbs fitted **TOTAL**	200W 100W 100W 100W 500W	 *885*	
Hot Water	Kettles (2) 3 boils per day = ~1 hour per week Coffee machine (est 2 hours/week use)	3kW 3kW	*78* 312	 %
Other Small Power **Kitchen**	Sound system Screens (8) Speakers (not used at maximum power) Fridge/freezer Whirlpool est. 1.5kWh/day Oven Hotpoint Microwave Vacuum cleaner	1kW 800W 4kWmax 200W 5kW 1kW 2kW	600 480 ~500 *500* *60* *26* 100	 %
Organ	Organ/Clavinova	500W	300	%
Oven	Gas Oven (Kitchen not used for catering)		minimal	

Estimated Annual Electricity Consumption 2019: 4,500kWh

Total electric item usage: 4,474kWh

Estimated allocations: Church 2,748kWh, *Hall 1,726kWh*

Total Energy use 138,900kWh

4.3 Energy Benchmarking

	Size (m^2 GIA)	St Agnes' Church, Reading use kWh/m^2	Typical use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
St Agnes' Church, Reading electricity: Church	350	7.85	20	10	39%
Church Hall electricity	230	7.50	20	-	38%
St Agnes' Church, Reading (heating fuel: church only)	350	192	150	80	128%
Church Hall Heating fuel	230	292	105	-	278%
TOTAL	580	239	170	90	140%

The church use is low largely due to efficient low energy lighting. Heating fuel use is hight because of the regular use of the hall and its heating system.

5. Energy Saving Recommendations (Electricity)

5.1 Lighting (fittings)

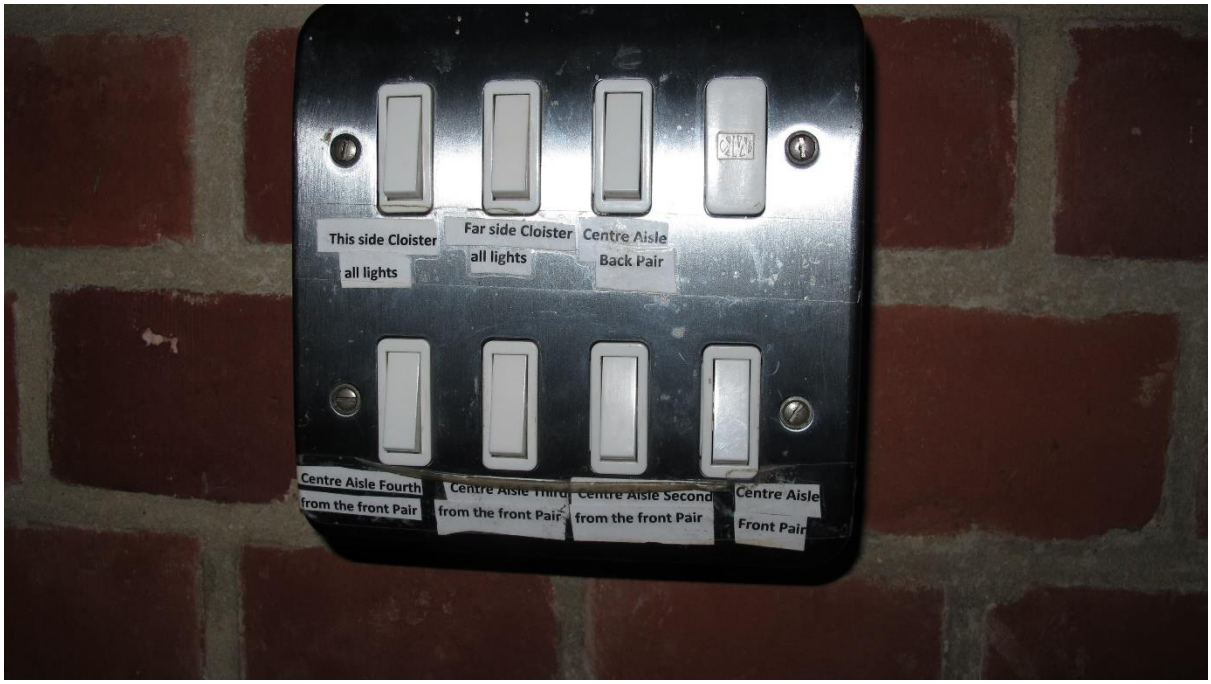
The lighting makes up a relatively small overall energy load within the building, as most areas within the church are already lit by LED or low energy bulbs. All remaining lights should also be changed, with any remaining incandescent or halogen bulbs replaced soon.

The lighting levels in the church were low. (3pm on a November afternoon, so limited contribution from daylight). Lux levels at head level were between 30 and 65 in the side cloister areas and between 30 and 60 in the main seating area. Levels in the musicians area were 50 to 65 and 80 in the chancel. The main lights in the nave could be replaced by more powerful LED lighting without much increase in energy consumption to deliver Lux levels of around 100. Low levels make reading difficult particularly for those over 50. https://www.thegreenage.co.uk/lux-much-light-need/

Most of the lights could be self-installed. In this case the £150 grant available through this process could be very usefully employed to fund the purchase of replacement LED lamps which the church installs themselves.

5.2 Lighting (control for internal lights)

The existing lighting control panel is well labelled.



6. Energy Saving Recommendation (Heating)

6.1 Heating System and Strategy - Church

The church currently uses gas central heating to heat the church. This is reported to work well and provides adequate thermal comfort into the church. Given that the system is successful it can be continued with in the short term and consideration given to the following improvements.

The Stelrad Ideal Concord CX boiler appears to date from 1985-89 (from its branding); therefore it will not attain current efficiency standards. It is likely to operate at 70-75% efficiency, compared to 93% for an optimised condensing boiler. Due to its age, it is wise to consider planning for replacement as part of re-ordering.

The church does not have sufficient hours of use at present to justify underfloor heating.

Providing constant background heating to the church building as a whole is excessive and wasteful of energy. This should be avoided.

The alternative to gas central heating would be installation of far infrared radiant panel heaters, see Section 7.1

If a replacement gas boiler is considered it will need to be capable of working with hydrogen in the fuel mix in the long term; so any replacement should be a hydrogen ready model. Hydrogen is due to be added to the gas grid over the next five year period. If plans to decarbonise the gas grid are implemented; the hydrogen mix will eventually exceed 20% and a hydrogen compatible boiler (and piping) will be required. The transition will be overseen by the regulatory bodies in a similar way to that between town gas and North Sea gas.

6.2 Heating System and Strategy – Hall

The Hall boiler is a Potterton Kingfisher 2, 38kW. It was noted that the cover panels had been bent, possibly by the lid having been stood on. The thin sheet metal can probably be straightened out during annual maintenance.

As above, if it is decided to continue with gas central heating, in the future a hydrogen ready boiler will be required.

The hall has sufficient use hours to justify underfloor heating, but it is an expensive installation which would require a significant closure period for the installation.

An alternative would be to replace the boiler with a heat pump. This would have a capital cost of the same order as a new boiler (plus some extra pipework to connect from the existing boiler location to an external heat pump, probably in the corner outside the toilet / kitchen area).

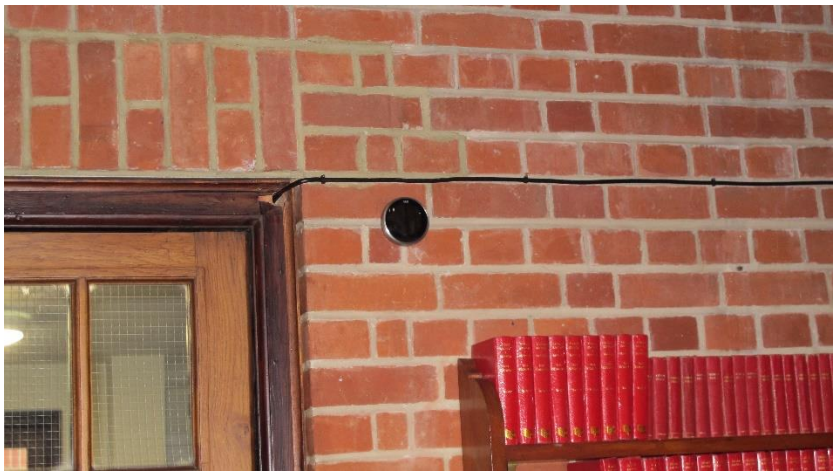
It is assumed the hall heat requirement is around 67,000kWh annually. [This is the consumption of gas; at 80% efficiency which is likely given the age of the boiler, this delivers 53,600kWh of heat.

A heat pump working at a COP of 3 would require 17,870kWh of electricity to deliver this amount of heat.

Currently, the hall annual gas bill is around £1,650. Replacing this by a heat pump using electricity at current rates would cost £2,200p.a. – an extra £550. If this extra electricity was available for free, moving to a heat pump would make economic sense. As an unlisted building, the church has potential to install solar panels on either the church south roof, or hall west roof. Section 11.1 shows how the west half of the hall roof could host a solar PV system delivering 9,600kWh (worth £1,180 p.a. at your current rate without considering any generation tariff income). A larger system on the church roof would be more expensive. If affordable and permissible this would be able to supply electricity for the majority of the church needs.

6.3 Temperature Set Point

Both church and hall thermostats are controlled by Nest software with a sensor in the church next to the door. This is being limited by church staff as users have been setting the system very high, up to 32°C. It is recommended that the church disable any controls which can be set by user groups.



Thermostat in church.

6.4 Boiler Timing Optimisation

Radiator systems with hot water remain hot for several hours after the boiler is switched off – experiments in the Diocese of Lichfield at over 50 churches have established that hot water radiator heating can be optimised by being switched off 45 minutes before the end of the service.

Purchasing of a temperature datalogger will allow the time for the church to heat (in different weather conditions) to be understood, as well as the time to switch off to be optimised. This would require someone with a computer to plug in the device and download the readings.

A suitable model retailing for around £40 is https://www.lascarelectronics.com/easylog-data-logger-el-usb-1/

6.5 Thermostatic Radiator Valves (TRVs)

The building is heated by radiators and none of the cast iron radiators observed have thermostatic radiator valves (TRVs) installed on them.

TRV's can be installed on the existing radiators and allow the users of the room to have some element of control over the temperature in the room and prevent over-heating which often leads to situations where the heating is on and the windows are open. It also allows un-used spaces to have the heating in them turned down.

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

6.6 Boiler Maintenance; Clean / Flush Existing Heating System

To ensure longevity, the system should be periodically flushed and cleaned to remove any scale and corrosion. The church should have a record of when this was done last.

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 turn 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 improve comfort for the occupants. Corrosion Inhibitor should then be added to the system and levels checked when your boilers are serviced annually.

Neither boiler appears to be fitted with a magnetic particle filter. This apparatus catches any rust or metal particles and prevents them being deposited on the boiler heat exchanger. They should be installed if it is planned to continue using the water heating systems long term.

6.7 Endotherm Advanced Heating Fluid

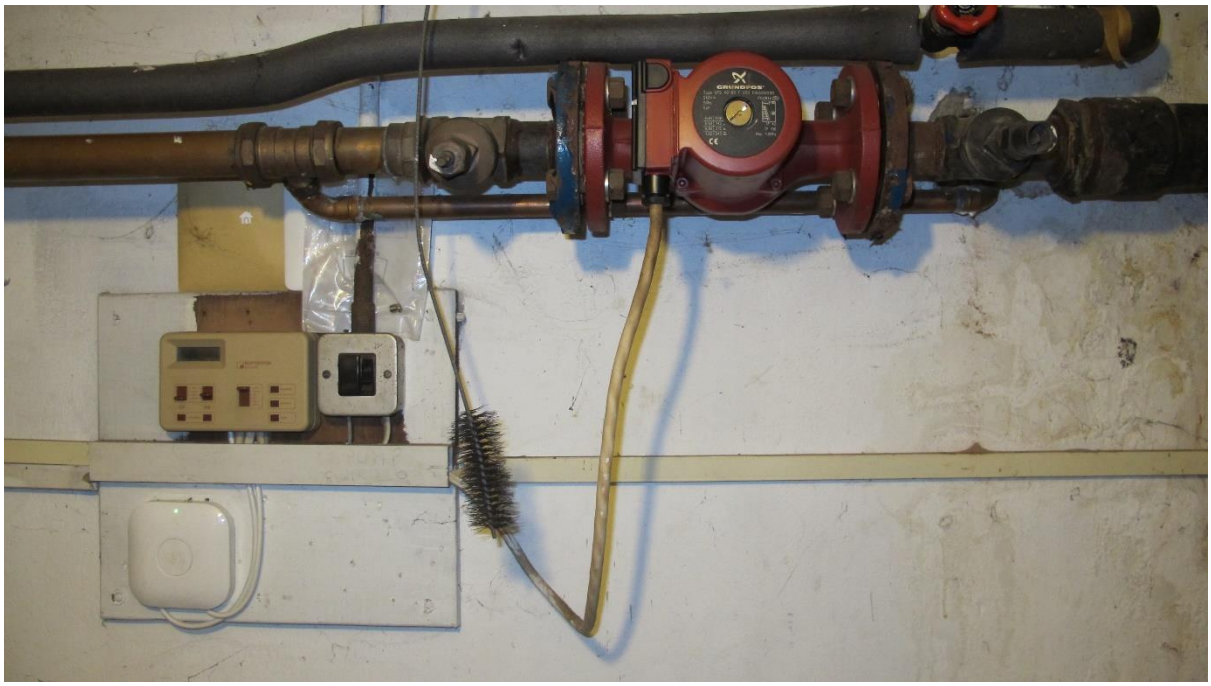
In order to improve the efficiency of the heating system further it is recommended that an advanced heating fluid (http://www.endotherm.co.uk/) is added to the heating system.

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.

6.8 Insulation of Pipework and Fittings

The pipework insulation is inadequate and incomplete. This should be supplemented with further insulation which ideally should cover the valve bodies in addition to the pipework.



7. Alternative Heating Systems

A church with low hours of use per week will always fall back to “base” temperature between heating events (it may take around 24 hours for the temperature to fall). A system which can heat rapidly, without sending most of the heat to the ceiling first, and in addition can be configured to heat small areas independently for small services or midweek meetings will be more efficient than one which seeks to heat up the whole volume.

7.1 Use of Electric Radiant Panels for Heating Specific Areas only

To avoid having to heat up the entire church building for any smaller mid-week services it is recommended that the PCC consider installing electrical panel heaters in the church.

One option would be to make a trial installation of a few panels, in the side cloister area; either mounted on the ceiling or on the walls. As these areas have the seating close to the walls and ceiling, low powered units would suffice. They could be used to create a small area which could be rapidly heated for small group use, without need to run the main central heating.

If found successful, more panels could be deployed to heat the central area – they would have to be wall mounted as the ceiling is too high.

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.

7.2 Under Floor heating

The church could consider installation of underfloor heating to the church *hall*, as it is a heavily used space. Underfloor heating would raise the floor level by 100-150mm.

It is suited to a regular usage pattern, and could be run from the existing boiler, or alternatively from an air source heat pump. The church itself does not have sufficient use hours to justify this; as it takes a long time to heat up it is suited to regularly used spaces.

However, installation of an air source heat pump and solar panels would be a less disruptive and better use of money as any power generation will offset electricity expenditure.

8. Energy Saving Measures (Building Fabric)

8.1 Roof Insulation

Roof insulation is a long-term aim of the church and is recommended.

8.2 Draught Proofing to Doors

There are a number of external doors in the building. Where these do not close tightly against the stone surround, such as the door to the south transept, a large amount of cold air is coming into the church around the side and base of the door.

Where a timber door closes against a timber frame it is recommended that draught proofing is fitted. 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. Note this cannot be used where the timber door closes directly against a stone surround.

Other simple measures such as using a small fridge magnet painted black over the large keyhole or the use of 'sausage dog' type draught excluders at the base of little used doors can prove to be very effective. Doors should be reviewed in daylight and gaps where the light shines through sealed or filled in whatever the most appropriate way is for the specific door.

8.3 Closed Door Policy

The main entry door should be kept closed in cold or windy weather and quickly closed behind the congregation by your friendly welcome team!

8.4 Windows

If there are draughts caused by windows not shutting correctly, a temporary solution is to use black plasticine to fill gaps.

9. Other Recommendations

9.1 Electric Vehicle Charging Points

The church has a car park to the side of it which serves the church and also the frequently used church hall. 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, probably on the side of the church hall 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

10. 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, regular use of hall
Battery Storage	Yes, with PV system
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	No – expense of installation
Air Source Heat Pump	Yes, Hall with large low temperature radiators
Biomass	No – not enough heating load as well as air quality issues

10.1 Solar PV potential

For St Agnes' church, the regular use of the church hall means that solar power is viable.

Any future move to using a heat pump within the hall would increase the attractiveness of solar power on site.

The government has advertised a "Smart Export Guarantee" to begin in 2020 which would pay for electricity generated and exported to the grid (the Feed in Tariff having ended). Any implementation of a PV system may be best to be delayed until SEG terms are guaranteed to assist financial viability. The Energy Saving Trust predicts that the SEG will pay 5.5p per kWh exported to the grid.

The south facing church roof is visible; and as an unlisted building installation may be acceptable. The other area is the west facing roof of the church hall at the rear of the complex.

The hall roof (west facing half) offers an area of around 80m^2. This could generate 0.15kWpeak/m^2 giving a 12kWpeak system, giving a total annual generation of 9600kWh. [A 1kWpeak system can generate 800kWh annually]. This is around double the estimated annual electricity use of church plus hall (4500kWh). An air source heat pump would need around a third of the hall's heating requirement – estimated to be around 18,000kWh; so the total annual requirement for heat pump, hall and church use is 22,500kWh.

Options include covering the whole of the hall roof on the west side, the church south roof as well and installing a battery (so that all of the energy generated can be used).

The church roof offers a similar area to the west of the tower.

Using average 2015-18 domestic installation costs (£1,750 per kWpeak); a 12kWpeak system would cost £21,000, plus extra for access at height and cabling. This does not include cost of any battery.

Recent estimates for larger installations including scaffolding are £1,200 per kWpeak giving a cost of £14,400 for the 80m^2 hall roof, £29k for both areas.

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.

The area vacated by the hall boiler could be used for the inverter.

Roof Area m^2	kWpeak kW	Annual Generation kWh	Installed cost £	Annual requirement from grid, given 22,500kWh need with heat pump kWh	Annual cost of grid electricity at current rates £	SEG income at 5.5p/ kWh £	Sum Annual Grid cost £
	Current	electricity	use	4,500	700	-	700
	Estimation	without	Heat	Pump			
80	12	9,600	14,400	4,500	0	280	280 profit
						5,100 exported	14 years payback [700 offset+280]
	Estimations	With	Heat	Pump			
80	12	9,600	14,400	12,900	1,588	132	1,456
160	24	18,000*	29,000	4,900	603	286	317

- Reduced due to some shading from the tower.

10.2 Heat Pumps to supply a conventional radiator system

The large size of the church indicates that any heat pump system would also have to be large.

Heat pump systems work best to deliver low grade heat for use with buildings in regular or constant use – not churches needing to be heated from "cold" once or twice per week.

The church hall, in regular use, could be heated either with conventional radiators powered by a heat pump (delivering 40-50°C water, so this may need larger radiators). NB: electric radiators for school use must not exceed 55°C, and 42°C in hospitals; so halls which are used by children and the elderly should not have radiators at very high temperatures.

Air source heat pumps require externally mounted units of similar appearance to air conditioning units. An ASHP could replace the gas boiler for the hall when it is due for renewal, a suitable location to install it could be the corner of the hall / toilet area.

ASHPs consume electricity but deliver between 2.5 and 4 times the amount of heat in kWh that they consume, [The Coefficient of Performance, COP] which brings them into a similar running cost as a gas boiler. In the case of St Agnes whose current electric price is 3.3x the gas price, a COP of 3.3 or greater would deliver a saving. If the church generated its own electricity, then there is a further saving. ASHPs should also have lower annual maintenance costs than gas boilers.

11. 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-Nov-2019.pdf

12. 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.