Energy Audit and Survey Report

St Mary's Church, Shenley

"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	Marisa Maitland	29th March 2021	1.2

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1. Executive Summary

An energy survey of St Mary's Church, Shenley 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 Mary's Church, Shenley is a mediaeval church dating from 1150 onwards. Electricity and Gas are supplied to the site.

The church is considering re-ordering which would include replacement of the Victorian bench seating. This would require relocation of two 3m long radiators. There are issues involving groundwater and an unsuitable boiler room which require remediation; solving these issues would be compatible with a plan to replace the 2012 installed boiler, which can be considered to be in mid life.

The church has a number of ways in which it can be more energy efficient. Our key recommendations have been summarised in the table below and are described in more detail later in this report. It is recommended that this table 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?
Enhanced draughtproofing of doors	5% 2,230	£84	£100	2	List B	Church warden, before winter
Install Infra Red electric panels in Lady Chapel (creation of rapidly heated area)	N/A, this would be for enhanced use of the building		£2,000		Faculty	PCC

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?
Install Solar Photovoltaic Panels on South Aisle and Nave roofs	All current electricity; 3,150 plus 11,250 for heat pump	£525 present grid cost. £2,020 if heat pump without solar	£32,600	62 Present 16 with heat pump	Faculty	PCC
Install Ground Source heat Pump to replace gas boiler	45,000 gas Use 11,250 solar power	£1,700 gas	£50,000	23	Faculty	
Total costs (not including extra electricity for heat pump)		£2,225	£82,600	37		
Total including extra for heat pump		£3,720	£82,600	22		

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

Based on the current contracted price of 14.028p/kWh for electricity and 3.681p/kWh for gas.

If all measures were implemented this would save the church around £2,000 per year in operating costs. There would be no gas cost and onsite electricity generation would equal demand.

2. Introduction

This report is provided to the PCC of St Mary's Church, Shenley 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 with a further aim 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.

The General Synod of the Church of England voted in early 2020 to aim at reaching net zero carbon emissions by 2030. This ambitious and prophetic decision encourages churches to view the Fifth Mark of Mission "To strive to safeguard the integrity of creation and sustain and renew the life of the earth" as a core part of their ministry.

An energy survey of the St Mary's Church, Shenley, Dudley Hill, Shenley, MK5 6LL was completed on the 24th March 2021 by Dr. Paul Hamley. Paul is an energy auditor with experience of advising churches and small businesses. He is part of the Church Energy Advisors Network 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 assessor for EcoCongregation.

St Mary's Church, Shenley	627720
Gross Internal Floor Area	220 m^2
Listed Status	Grade I List entry 1160730
Typical Congregation Size	110

The church is typically used for 21 hours per week for the following activities:

Services	7 hours per week
Meetings and Church Groups	6 hours per week
Community Use	2 hour per week
Occasional Offices 40 weddings p.a. 4 funerals p.a.	6 hours per week

Church annual use: 1100 hours

Heating hours: Church: 900 hours (44,633kWh / 50kW plant)

Estimated footfall (church): 16,000 people

3. Energy Procurement Review

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

The current electricity rates are:

Single / Blended Rate	14.028p/kWh	In line with current market rates
Standing Charge	30.10p/day	N/A

The current gas rates are:

Single / Blended Rate	3.681p/kWh	In line with current market rates
Standing Charge	Zero p/day	N/A

The church has recently joined the Parish Buying scheme, so the rates going forward should be lower than the recent values quoted above.

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 Mary's Church, Shenley uses 3,150 kWh/year of electricity, costing in the region of £525 per year, and around 44,600kWh of gas, costing £1,682, both figures being for the year 2019.

This data has been taken from the annual energy invoices provided by the suppliers of the site.

Utility	Meter Serial	Type	Pulsed output	Location
Electricity – meter 1 (Left)	E15Z003883	EDMI Atlas Mk7c	Yes	Lean to shed, NE corner next to vestry
Electricity – meter 2 (Right)	E15Z004568	EDMI Atlas Mk7c	Yes	As above
Gas	E016 K17156 15 D6	Elster themis BK-G10E	Yes	Subterranean boiler room, NE of vestry

Provision of two electricity meters is from the period when there was separate day and night billing.

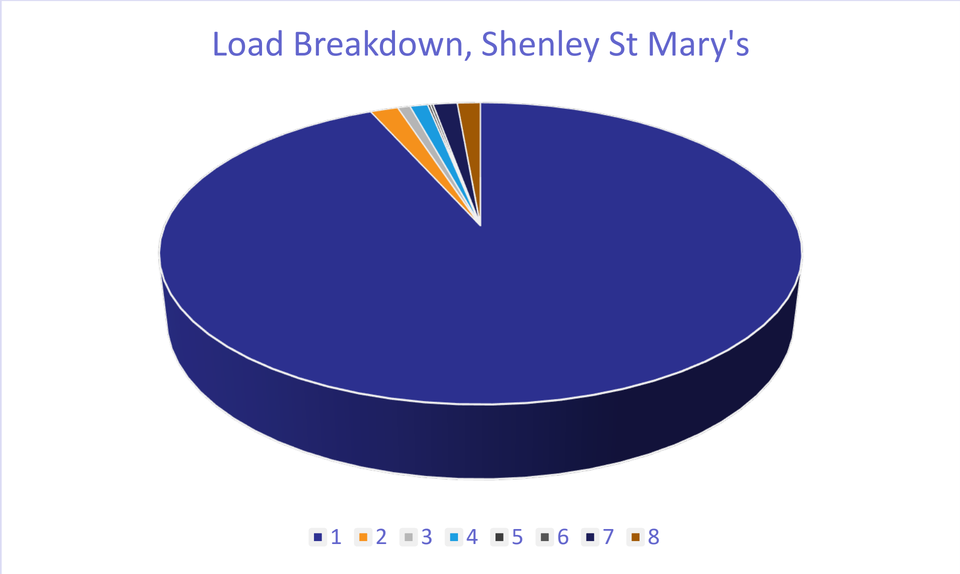
It is recommended that the church consider asking their suppliers to install smart meters so that the usage can be monitored more closely, and the patterns of usage reviewed against the times the building is used.

4.2 Energy Profiling

The main energy use within the church can be estimated as follows based on approximate hours if use and equipment power ratings:

Service	Description	Power	Annual Use/ kWh	Estimated Proportion of Usage %
Heating [Gas]	Vaillant EcoTec boiler	50kW	**44,633**	93%
Heating [Electric]	Wall mounted heater – vestry area (100 hours) Wall mounted heater – ringing chamber (100hours) Towel rail – out of use	2kW 2kW	 800	 1.7%
Lighting **Nave** **Aisles** **Chancel** **Lady Chapel** **Tower** **Vestry** **Toilet**	All LED 10 LED spotlights, 100mm diameter 10 LED spotlights, 100mm diameter 4 LED spotlights, 100mm diameter 2 small spotlights 3 LED spotlights 5 LED spotlights 2 x 40cm diameter diffuser CFL One diffuser CFL 1100 Occupancy hours TOTAL	 100W 100W 40W 15W 30W 50W 90W 40W 465W	511	1.0%
Lighting [External]	3 x PIR controlled lights (500 hours)	150W	75	0.1%
Hot Water	15litre Heatrae Sadia immersion heater (rarely used except for large events) Point of use water heater (normally used) Coffee machine Toilet hand wash heater	3kW 1.5kW 2kW 1kW	100 150 100 10	 0.8%
Other Small Power	Vacuum cleaner	1.5kW	80	0.1%%
Organ, PA	Organ (300 hours pa) Keyboard (300 hours) Sound System (400 hours)	1.5kW 150W 500W	450 45 200	1.4%
Kitchen	Electric Oven Fridge/freezer	3kW 200W	80 584	1.4%

Total Annual Electricity Consumption 2019: 3,150kWh



KEY 1 Gas Heating 2 Electric heating 3 Hot water 4 Lighting (internal)

5 Lighting (external) 6 Small power 7 Organ, music, PA 8 Kitchen

4.3 Energy Benchmarking

In comparison to national benchmarks for Church energy use St Mary's Church, Shenley uses an average amount of electricity for a church of this size.

Comparison date is for churches of below 250m² internal area. Heating fuel is 40% above average.

	Size (m² GIA)	St Mary's Church, Shenley use kWh/m²	Typical Small Church use kWh/m²	Efficient Church Use kWh/m²	Variance from Typical
St Mary's Church, Shenley (electricity – 3,150kWh)	220	14.3	14	10	+2%
St Mary's Church, Shenley (heating fuel – 44,633kWh	220	202.8	145	80	+40%
TOTAL = 44,783kWh	220	217.2	159	90	+36%

There currently no benchmark data which takes hours of use and footfall into account.

[1] CofE Shrinking the Footprint – Energy Audit 2013

5. Energy Saving Recommendation (Heating)

5.1 Heating System and Strategy

The church is part of a benefice of five churches within Milton Keynes. The city has grown to incorporate the village. The church has a particular role as the “cultural church” in the grouping – it is used for concerts, a local musician has used it for a CD launch, community groups and a walking group use or visit it. It hosts a large number of weddings per year (around 40). A reordering scheme is proposed to create a large space which could be used for concerts and exhibitions.

The church currently uses gas fired central heating to heat the church. This is reported to work well and provides adequate thermal comfort into the church. The boiler is a Viessmann EcoTec, light commercial model, thought to be of 50kW capacity.

It serves a network of large pressed steel radiators in the nave and aisles (4 x 3m length, 5 x 1.8m length) plus a smaller pressed steel radiator with narrow bore pipework in the vestry.

The boiler was installed in 2012 and appears to be in good order. At 9 years old, it should be assumed to be in mid life, so a boiler replacement plan should be developed.

Currently, the building is used for around 20 hours per week (pre covid data), this usage is too low to justify very expensive underfloor heating. The church is planning to replace the current late Victorian bench seating with movable seating which could allow the nave and aisles to be used in different ways. Removal of the benches will require removal of the large centrally located 3m long double radiators. These could be relocated: one along the north aisle wall (requiring the 1.8m one to be removed and the 3m one to be moved along), the other along the south aisle wall, along from the existing 3m one. The now spare 1.8m unit could go between the porch and south west corner.

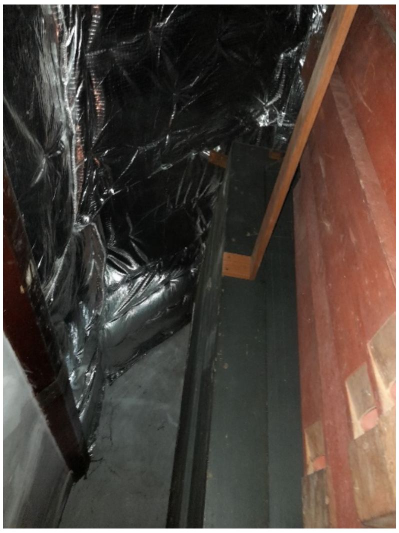
The array of large double radiators means that the building is technically compatible with the installation of a heat pump. These normally provide water at 50-55°C, rather than traditional CH systems at 70-80°C, so large radiators are required.

The hours of use of the building are low for technical success of an Air Source Heat Pump [ASHP].

A Ground Source [GSHP] would seem to be more suited, with lower running costs (but greater capital cost). The churchyard precludes installation of a subsurface pipe network, so either a borehole, or use of the adjacent council owned field would be needed. Section 9.2 gives further details.

If the gas boiler is replaced by another, its replacement will need to be hydrogen ready. This would lock the church into fossil fuel use for several decades. 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. Current debate within the industry suggests there are a lot of unknowns. Partial decarbonisation of the gas network will also involve increasing use of Anaerobic Digestion plants (making gas from agricultural and food waste; some tariffs supply 20% of this "green gas"). It looks unlikely that the gas supply can be fully decarbonised and not in a short timescale, so this is not likely to deliver a "net zero" solution.

The choir stalls (above), situated under the crossing tower might be heated by under pew heaters, if this were found to be necessary to top up the space heating. This may not be necessary, as the north transept ceiling over the organ has been insulated (image below), and there is a relatively low ceiling above (with the ringing chamber above this).

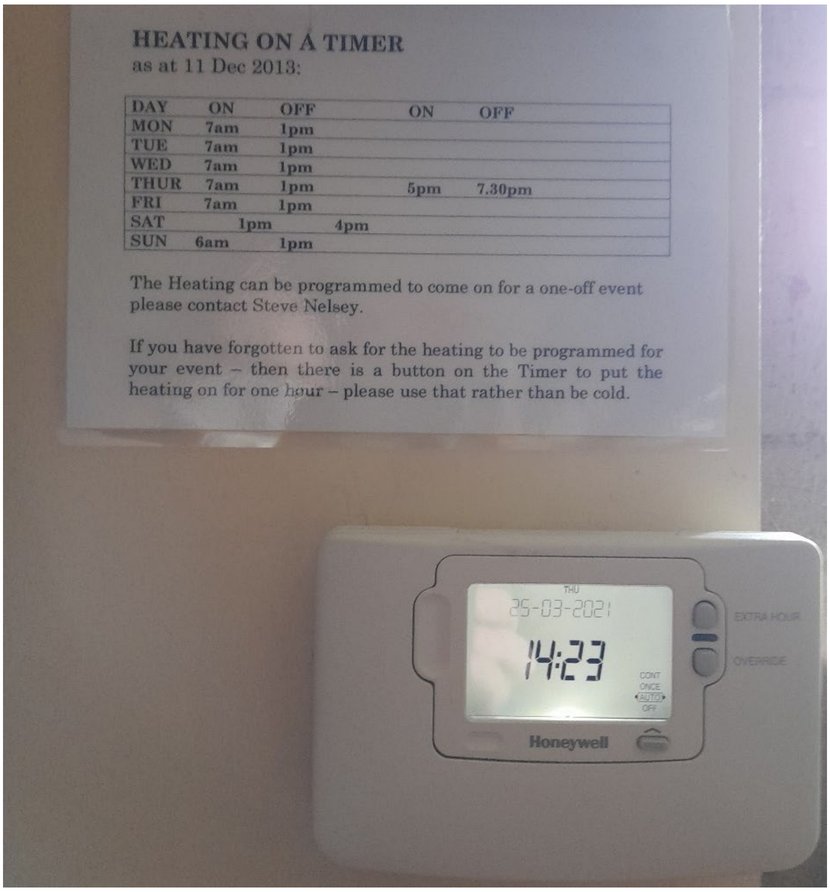


The Lady Chapel (above, right) may be considered to be thermally isolated by a glass screen in the future. If this occurs, direct electric heating could be provided by radiant infra red heating panels (non glowing), as these would offer rapid heating, so the chapel could be used for small meetings held at short notice without having to heat the whole of the building.

5.2 Discontinue Background Heating

Continuous background heating has been tried out at St Mary's Church. It was discovered to be more expensive than heating on demand, and problems with the floor occurred with parquet blocks lifting. This is not recommended for a building with low hours of use.

5.3 Boiler Timing Optimisation



The boiler timings for Sundays are ON 06:00, OFF 13:00, other days 07:00-11:00.

Where there is no midweek use, hours of heating should be reduced, especially during the "shoulders" of the heating season: September, October, April.

The church service at 11:00 finishes with people leaving by 13:00. 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. As you have people present until 13:00 you could experiment with turning it off at 12:00.

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/

This will indicate whether any of the midweek heating when there is no use of the church serves a purpose – if temperature returns to "base" between each day's heating, this shows all the heat input is being lost. It is better to plan for a earlier start for Sunday heating.

5.4 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.

5.5 Magnetic Particle Filter

The boiler does not appear 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. One should be installed if it is planned to continue using the water heating systems long term.

5.6 Corrosion Inhibitor

This should be added to the system when your boilers are serviced annually.

5.7 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. 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 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.

6.1 Use of Electric Radiant Panels for Heating Specific Areas only

Neither aisle or nave roof are suitable for installation of rectangular panels for aesthetic reasons. The aisle beams are too close together.

Far infra red rectangular panels (non glowing) would allow the Lady Chapel to be independently heated should it be glassed in and used as a small meeting rom. e.g. for midweek prayers or communion.

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.

6.2 Under Pew heating

Should additional heating be required in the choir stall area, under pew heating is recommended. However, discussion indicates that the area is already sufficiently heated.

Suitable pew heaters would be BN Thermic PH30 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating. Cable runs to the pew heaters could run along the North and South walls (all cabling should be in armoured cable or FP200 Gold when above ground) to the both rows of pews quite easily.

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.

7. Energy Saving Measures (Building Fabric)

7.1 Draught Proofing to Doors

There are a number of external doors in the building. These have the original historic timber doors on them, but these do not all close tightly against the stone surround and hence a large amount of cold air can enter the church around the side and base of these doors, which occurs continuously.

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 can not 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 key hole 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.

Some of the doors at St Mary's have been fitted with a rubber seal where the door closes against stonework. This does not cover the bottom of the door. There may be an opportunity to fit a weather seal here, inside the green carpet.

7.2 Closed Door Policy

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

7.3 Windows

Where there are draughts caused by clerestory hopper windows not shutting correctly, a temporary solution is to use black plasticine to fill gaps. This could be done for the south clerestory windows, which are kept locked shut following entry by an intruder.

7.4 Drainage, Foundations, Water Damage

It was reported during the audit that there was one location with a cracked drain or gully.

The image above shows that the ground around the church is built up in each direction (apart from at the east end, which slopes away), effectively creating a moat for groundwater to drain into. This may be associated with historic burials raising the ground level; bones in unmarked graves having been found near to the church when digging a trench. The topography may be contributing to the water ingress into the boiler room and former coal / oil store area.

Maintaining a suitable outlet for water which collects in the stone guttering at the base of the walls (drainage ditches and soakaways) should be discussed with your Inspecting Architect.

Any water retention close to the building will lead to rising damp within the walls and consequent fabric damage and higher heating costs.

The boiler room is located under the Victorian era vestry, dating from 1888. The coal store and “reservoir” are under the lean to structure which houses the organ blower, and the bin.

Water ingress to the coal store may be occurring through the concrete slab, or around the oil filling hatch, or the nearby drain (below).

The former coal store acts as an unintentional reservoir.   It is the location of the redundant, but not necessarily empty, oil tank (rusted, to the left) has collected around 40cm depth of water. This may be due to the nearby drain (above) leaking, or the gulley and soakaway system which unintentionally allows a route for water to pool in this void, or it may be due to the concrete slab above the space allowing water through directly.

It is recommended that the oil tank and any contents are removed before it rusts though and results in an oil spill into the ground. The bottom of this store is higher than the floor level of the adjacent boiler room; some pipework and the expansion tank is located close to the floor. If the single course of bricks currently retaining the water is punctured, damage to plant will ensue.

An unintentional reservoir of ground water is maintained by the low brick wall to the fore.

If this water does not seep away, further ingress will overtop the wall and run into the boiler room.

If it does seep out, it is going into the foundations.

It is recommended that the Inspecting Architect is asked to investigate the foundations of the vestry which form the boiler room walls, particularly the wall on the north side pictured below, where there is water ingress through the gas pipe conduit.

The isolation valves each side of the circulation pump have been severely corroded and cannot be turned. The red expansion tank is corroding and most of its paintwork is loose.   The stopcock supplying water to the site (out of picture, above right) is corroded shut.   The white guttering channels water from a leak to the drain below the condensing boiler to the right.

The valves may be "rescued" by an application of WD40 and oil, allowed to soak in. Do not attempt to hit valves with a hammer to free them.

It is recommended to consult a plumber to regain a working stopcock as a priority.

[Any burst pipe or flood will increase site energy use – extra heating for drying out, and powering contractors plant for repairs].

It is recommended to insert some sort of plastic sheeting between the wall and valves, recirculating pump and gas meter to protect them from water.

Water has been coming through the wall where the gas pipe enters. The wall was described as "crumbly".

Remediation works to this area may be required. If the church chooses to proceed with a heat pump installation, this area under the vestry and the coal store under the lean to shed would be needed for plant installation: a combined solution which ensures (i) water ingress is halted (ii) any issues with the vestry foundations are solved (iii) a dry plant space is created is likely to be needed.

This might involve removing the lean to shed and creating a new plant space in the coal store space, rather than putting plant under the vestry. It will require input from architect and plant supplier, after a decision/ permission has been reached on the type of heating plant. Such a project would encompass necessary drainage and waterproofing works protecting this part of the building.

8. Saving Recommendations (Water)

8.1 Detergents for Cold Water Hand washing

Use of cold water for hand washing can be just as effective as using hot.

https://www.nhs.uk/news/lifestyle-and-exercise/cold-water-just-as-good-as-hot-for-handwashing/

9. 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, south aisle and nave
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, either borehole or potential use of nearby field
Air Source Heat Pump	Unlikely, use hours too low (21 per week)
Biomass	No –air quality issues and space for plant

9.1 Solar PV potential

The nave and south aisle roofs are low pitched and offer sites for installation of solar photovoltaic panels which would not be visible behind the parapets.

The Smart Export Guarantee pays about 5p/kWh for electricity generated and exported to the grid (the Feed in Tariff having ended). One of the issues for churches is that most lighting use is at periods when the electricity is not being generated, so installation of a battery to make maximum advantage is recommended. Battery Storage is not strictly a renewable energy solution but provides 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. This is a new but fast-growing technology.

If a heat pump is installed, solar power greatly enhances its viability, as the pump can run whenever the sun shines.

For St Mary's church, the relatively flat nave, chancel and south aisle roofs offer a potential location – this would have to be confirmed with your architect as to suitability for extra weight and wind loading on the roof structure.

The different roofs offer areas of around 150m^2. (nave 84, south aisle 36, chancel 30). This could generate 0.15kWpeak/m^2 giving a 22.5kWpeak system. A 1kWpeak system can generate up to 1000kWh annually, although due to the proximity of the tower an overshading factor should be applied to give 900kWh per kW peak and a total annual generation of around 20,000kWh.

Annual Generation (kWh) = Area x 0.15kWp/m^2 x K factor x Orientation Factor x Overshading Factor

= 150m^2 x 0.15kWp/m^2 x 1000kWh/kWp x 1 x 0.9

= 20,250kWh

This much larger than the church's annual electricity use (3,150kWh) – although once the amount required to operate a heat pump is added, generation equals demand.

Electricity requirements of a heat pump are estimated at 11,250kWh (GSHP) or 18,000kWh (ASHP), which suggests that installing a large solar array would provide all of the church electricity needs with a heat pump, this would create a zero carbon church.

Using a battery will extend the usefulness of the power generated during the day into the evening, but some exporting of power to the grid in summer, and purchase from the grid for winter evenings will occur.

Using average 2019 installation costs (£1,450 per kWpeak); a 22.5kWpeak system would cost £32,625. This does not include cost of any battery.

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

9.2 Heat Pumps

The age of the churchyard indicates significant burials, and lack of sufficient space for ground source heat pump coils.

Air Source Heat Pumps [ASHPs] require externally mounted units of similar appearance to air conditioning units. Typically, they produce 2.5 to 3 times the amount of heat in kWh which they consume in electricity. They are not recommended for buildings with low hours of use due to technical problems with defrosting.

Location on the exterior of the building to accommodate a large until would require rebuilding the lean to shed / former coal store area to create a sunken plant area; either a building with large vents, or a perimeter wall to hide the plant behind.

Ground Source Heat Pumps [GSHPs] are more efficient than air source, as the average temperature of the ground is higher than that of the air. They require either a borehole, or extensive trench digging – which is unlikely to be possible in a churchyard with burials. An option to investigate is offered by the field to the west of the church. Despite higher capital cost; the lower operating cost recommends them if they are feasible to install. An example of a church with a borehole GSHP system is St Mary the Virgin, Ashford town centre.

The church path, which is flanked by mature conifer trees, leads to a council owned field.

It is worth investigating whether ground source coils could be located in this field (the Council may have renewable energy targets to meet).

Costs

Air Source – to provide 50kW of heat:

Capital cost estimate: £20,000

Operating cost at COP of 2.5:   45,000kWh/ 2.5 = 18,000kWh x 14.028p/kWh = £2,525

Ground Source – to provide 50kW of heat

Capital cost estimate: £50,000

Operating cost at COP of 3.5:   45,000kWh/ 3.5 = 12857kWh x 14.028p = £1,803

At a COP of 4 (reasonable), this gives 11,250kWh and £1,578

It should be assumed that the annual kWh heating load will rise with increased use, by more than savings from draughtproofing (around 5%).

10. 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

Trust for Oxfordshire's Environment (TOE) does have some funds available (over and above the small implementation grants of £150 available through this scheme) to support energy efficiency improvements in community facilities. If your church is used by the wider community, visit www.trustforoxfordshire.org.uk or contact admin@trustforoxfordshire.org.uk to find out if your project is eligible for a grant of up to about £5,000.

11. 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.

12. Report Circulation

In addition to the PCC, this report is also sent to:

1. Your DAC secretary and your DEO, because
    - They maybe be able to offer you help and support with implementing your audit
    - They want to look across all the audits in your diocese to learn what the most common recommendations are.
2. Catherine Ross, the officer in the Cathedral and Church Buildings team centrally who leads on the environment, who wants to learn from all the audits across the country. She will be identifying cost-effective actions churches like yours might be able to make.