



Energy Audit and Survey Report

St John the Baptist Church, Burford



“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

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1. Executive Summary

An energy survey of St John the Baptist Church 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 John the Baptist Church is large and important Grade I listed parish church dating back to 1175. It has a high number of tourists and visitors and is open from 9am to 5pm daily. There is both oil and electricity supplied to the site.

The church has a number of ways in which it can be improved. 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.

| Energy saving recommendation | Estimated Annual Energy Saving (kWh) | Estimated Annual Cost Saving (£) | Estimated capital cost (£) | Payback | Permission needed | CO2 saving (tonnes of CO2e/year) |
|---|--------------------------------------|----------------------------------|----------------------------|----------------|-------------------|----------------------------------|
| Switch electricity supplier to ones which provide 100% renewable supply | None | None | Nil | N/A | None | N/A |
| Install under pew heaters to choir stalls | None – Comfort Improvement | N/A | £4,000 | N/A | Faculty | N/A |
| Fit Far I-R panel heaters to tower and St Thomas Chapel | None – Comfort Improvement | N/A | £1,500 | N/A | Faculty | N/A |
| Repair/replace fan heaters under entrance step | None – Comfort Improvement | N/A | £2,000 | N/A | List A | N/A |
| Overdoor heater above west door | None – Comfort Improvement | N/A | £2,000 | N/A | Faculty | N/A |
| Replace heaters under the six settles | None – Comfort Improvement | N/A | £6,000 | N/A | List B | N/A |
| Install trench heaters down aisle | None – Comfort Improvement | N/A | £30,000 | N/A | Faculty | N/A |
| Relocate column radiators to lady chapel and Lobb Monument | None – Comfort Improvement | N/A | £3,000 | N/A | Faculty | N/A |
| Consider air source heat pump | Save oil, increase elec | N/A | £50,000 | N/A | Faculty | N/A |
| Install PV system to roof | Significant | £1,500 | £15,000 | 10 to 12 years | Faculty | 3 tonnes/year |



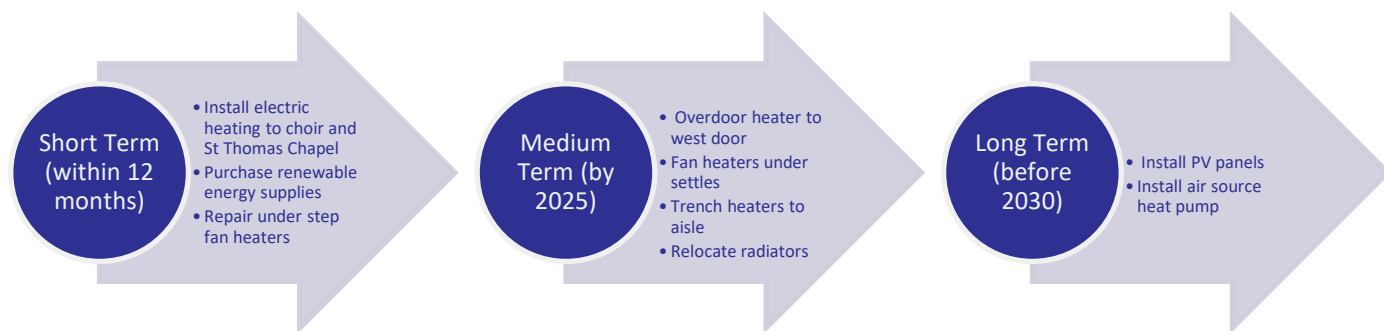
The Church should check any faculty requirements with the DAC Secretary at the Diocese before commencing any works.

No oil bills or usage data have been provided for this audit therefore financial calculations cannot be made.

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.

This church has a clear route to become net zero by 2030 by undertaking the following steps:



3. Introduction

This report is provided to the PCC of St John the Baptist Church 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 John the Baptist Church, Church Green, Burford, OX18 4RY was completed on the 8th November 2019 by Matt Fulford. Matt is a highly experienced energy auditor with over 15 years' experience in sustainability and energy matters in the built environment. He is a chartered surveyor with RICS and a CIBSE Low Carbon Energy Assessor. He is a Member of the DAC in the Diocese of Gloucester and advises hundreds of churches on energy matters.

| | |
|-----------------------------------|--------------------|
| St John the Baptist Church | 627242 |
| Gross Internal Floor Area | 967 m ² |
| Listed Status | Grade I |

The church typically used for 26 hours per week for the following activities

| | |
|-------------------------------------|------------------|
| Services | 6 hours per week |
| Meetings and Church Groups | 4 hours per week |
| Open and manned church for visitors | 50 hour per week |

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

4. Energy Procurement Review

Energy bills for electricity have been supplied by St John the Baptist Church and have been reviewed against the current market rates for energy.

The current electricity rates are:

| | | |
|------------------------|--------------|-----------------------------------|
| Single Rate | 13.054 p/kWh | In line with current market rates |
| Standing Charge | 26.097 p/day | N/A |

The electricity is supplied by British Gas and is not purchased on a renewable tariff .

Going onto a renewable tariff is an important part of the process of taking churches towards net zero. The church is therefore encouraged to consider the Parish Buying Scheme, which uses the power of group purchasing to offer economies of scale in the procurement of energy. Its 'Green Energy Basket' tariff delivers 100% renewable electricity. We would recommend that the church obtain a quotation for its electricity supplies from the scheme:



<http://www.parishbuying.org.uk/energy-basket>. Alternatively Bulb, Ecotricity and Good Energy are suppliers which offer 100% renewable electricity.

No oil energy bills have been provided for the purpose of this audit therefore a review of the oil energy procurement has not been possible.

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

| | | |
|------------|--------------|--|
| VAT | 20% | The church is a charity and therefore should be benefiting from only be charged a 5% VAT rate. A VAT declaration should be sent to the supplier to adjust this. |
| CCL | 100% charged | As the church is being charged the wrong VAT rate, they are also being charged CCL which should not be applied as they are a charitable organisation,. Sending the supplier a VAT declaration will remove this charge. |

The above review has highlighted that VAT and CCL are being charged on the electricity bills. The church is a charity and therefore can claim VAT exemption status. As such the PCC of St John the Baptist Church should send the supplier at VAT declaration confirming this and check all supplies on other sites. VAT declarations are available from the suppliers website and can usually be found by typing the suppliers name followed by “VAT Declaration Certificate” into most website search engines.

5. Energy Usage Details

St John the Baptist Church uses 42,329 kWh/year of electricity, costing in the region of £5,525.63 per year (excluding VAT and additional charges).

This data has been taken from the annual energy invoices provided by the suppliers of the site. St John the Baptist Church has one main electricity meter, serial number D06C10995.

No invoices for the oil consumption have been supplied, so this has not been able to be included.



6. Energy Saving Recommendations

6.1 Lighting



The church has a modern lighting system with extensive dimming and scene setting. The nature of the lighting system means that converting to LED will need to be a carefully considered project given the use of dimming racks in the current system. Advice should be taken from the lighting controls maintenance company on any energy saving improvements that can be easily implemented and the greater use of LED within the system is to be encouraged.

6.2 Heating System



The existing heating system uses a 250kW oil boiler which dates from 2004. There are issues with the church heating in that it fails to provide sufficient thermal comfort to the church. The cause of this appears to be that the heat output of the radiators connected on to the system appear to be around half of the boiler output and largely insufficient in terms of their output and location to provide adequate heat.

The existing oil boiler can be expected to have a life of another 10 years before starting to fail and it is recommended that over that time efforts are made to gradually adapt and improve the system so that it can convert to an electric / heat pump solution in the future and move away from oil.

The church benefits from a 100A 3 phase electricity supply so has sufficient capacity to power some electrical heating.



To improve the heating, we would recommend the following:

Short Term

- Install electric under pew heaters to the choir stalls. The choir stalls are currently poorly heater and suffer with discomfort. We would suggest that <http://www.bnthermic.co.uk/products/convection-heaters/ph/> heaters are installed under the pews and this would result in 20 heaters (16nr PH45 and 4nr PH30) being installed in total they would only need to be switched on around 30mins prior to that area being used. This would provide 8.4kW of heat to this space being provide directly under those occupying the choir stalls and should be fairly transformational in terms of comfort.



- Fit Far IR panel heaters to the walls under the tower (x4) and to the wall of the St Thomas Chapel We would suggest <https://www.warm4less.com/infrared-heaters/platinum-range/> which are extremely thin and frequently used in churches to provide discrete heating. Both these spaces have a poor provision of heat and the use of electrical heaters will allow them to be heated independently for smaller services or other uses without needing the entire heating system to be ramped up.



- Repair/refurbish fan heaters under the step in the porch and into the nave from the north door. There are fan heaters located under the two steps, one within the porch and one as you step down into the nave. These are reported to be non-operational but would provide some degree of heated air curtain and help to prevent the heat from escaping from the church through the open door. It is recommended that these are reviewed by a heating engineer and bought back into use.



Medium Term

- Consider installing an overdoor heater above the west door, hidden within the curtain pelmet area. This door is used for some event and also acts as a source of cold draughts. The recommendation below for draught sealing will help but there is a location within the curtain pelmet, where an overdoor air heater could be located to provide some additional heat to this area and prevent the cold draughts from affecting the rest of the nave.

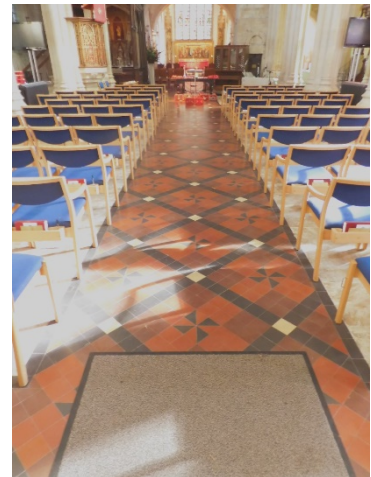


- Review changing the existing radiators under the six settles to a fan assisted unit. There are small cast iron radiators under the six settles around the church, because these are effectively boxed in on 3 sides their output is severely reduced. In order to provide a better heat output and to prepare the church to be heated from a heat pump in future, it is recommended that these radiators are removed and replaced with a fan assisted unit. Small fan assisted units such as the Myson Lo-Line RC https://www.myson.co.uk/products/lo_line_rc.htm are available on the market and two of these may fit under each settle which could increase the heat output and improve the distribution of heat into the nave. There is a fan noise associated with these units although at normal fan speeds this is a background hum, at boost levels it is noisier so this would be used prior to a service in a warmup period and set back during the service itself.



Longer Term

- Install trench heaters down either side of the main aisle and to the central side of the side aisles. The heat distribution within the main nave of the church is poor and given that the church is clear of pews the only way of adding heating within the main body of the church will be to have some heaters located within the floor. It is suggested that the easiest and neatest way to achieve this would be to have linear trench heaters located down the side of the tiled aisles which could be installed by lifting the contemporary stone along the edge and running a 200mm deep trench to install heaters into such as <http://www.trenchheating.com/aquafan-2.php> - this will install another 50kW of heat output into the nave much closer to the congregation and evenly distributed across the floor area.
- Relocate two existing column radiators between the nave arches. There are currently two column radiators located in between the nave arches which restrict the flexibility of the space. These radiators should not be lost from the heating systems so they could be relocated, one to the wall where the tall bookcase currently stands and one to Lady chapel under the Lobb monument so that they continue to provide useful heat in areas where is it most required.



6.3 Quattro Seal

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

It is recommended that 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



7. Renewable Energy Potential

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

| Renewable Energy Type | Viable |
|--------------------------------|---|
| Solar PV | Yes – non-visible roofs |
| Battery Storage | Yes – in conjunction with above PV |
| 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 | Potentially using a radial drilling technique but only when existing boilers reach end of life |
| Air Source Heat Pump | Potentially as an alternative option to ground source heat pump |
| Biomass | No – not enough heating load as well as air quality issues. Potential to have a biomass pellet stove in the old fireplace in the vestry to provide local heating to the room. |

There is potential for a large PV array on the roof of the hidden South facing roofs which are non-visible. The current arrangements around solar panels mean that to be financially viable the building on which they are mounted needs to consume the vast majority of the energy that they produce. As this church is open for visitors on a daily basis there is a regular use of electricity during daytime hours and therefore a PV array would be viable. If the future heating system moved more towards electric / heat pump this would increase the viability and size of PV array that would be suitable. The church would be encouraged to review the extensive PV array installed on Gloucester Cathedral by a local company using a system which did not penetrate the roof coverings.



<https://www.mypoweruk.com/gloucester-cathedral-installation/>

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.

As the boilers were installed in 2004 they should last for another 10 to 15 years. At the point of their failure consideration should be given to the use of heat pump technology and avoid the use of oil. The use of either air source or ground source (using a radial drilling technique to avoid disturbing any archaeology) could both be viable but would need to be reviewed at the point in the future when this becomes more relevant.



8. Funding Sources

This audit programme offers each participating church the chance to apply for a grant of up to £150 towards implementing some of the audit's recommendations. An application form is included with this report.

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>.

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.

9. Faculty Requirements

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

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

Under the new faculty rules.

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

List B is for works which can be undertaken without a faculty but must be consulted on with permission sought from the Archdeacon through the DAC. This includes works of adaptation (but not substantial addition or replacement) of heating and electrical systems and also the replacement of existing boilers so long as 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.

