Energy Audit and Survey Report

All Saints Church, North Moreton

"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
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Contents

1. Executive Summary

An energy survey of All Saints Church, North Moreton 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.

All Saints Church, North Moreton is a Grade 1 listed rural parish church which dates back to the 12th, 13th and 14th centuries. There is only electricity supplied to the site to provide both heating and lighting.

The site audit and the examination of the churches currently energy usage against other similar churches demonstrates that this church is already exceptionally energy efficient. The church only really uses energy for heating and lighting and the lighting has already been replaced for LED throughout, so no further efficiencies are possible in that area. It is therefore the heating area which remains. While it should not be expected that the church can achieve major savings on its heating energy usage, it can make improvements that will provide a much more comfortable environment without increasing the energy costs substantially. This report therefore focuses its recommendations solely on the most efficient methods for improving the heating within the church.

The heating could be improved by;

- Installing under pew panel heating to the pews in the nave
- Removing the overhead radiant heaters to the nave
- Installing an overhead panel heater to the vestry
- Installing a panel heater behind the altar
- Considering installing under pew heaters to the choir stalls and removing the overhead units to the chancel.
- Considering removing the radiant heater above the door to the church and installing an overdoor air heater in its place.
- Installing an extra plug socket under the pulpit area and having two temporary tripod heaters available to provide spot heating when required.

All works above could be considered under a List B permission as they are modifications or upgrades to existing installations which already exist within the church.

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

2. Introduction

This report is provided to the PCC of All Saints Church, North Moreton 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.

All Saints Church, North Moreton is a Grade 1 listed rural parish church which dates back to the 12th, 13th and 14th centuries. It has electricity only and is lit by LED lighting and heated via overhead radiant heaters.

An energy survey of the All Saints Church, North Moreton, Wallingford Road, North Moreton, Didcot, OX11 9BA was completed on the 16th July 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.

All Saints Church, North Moreton	
Gross Internal Floor Area	314 m^2
Listed Status	Grade I
Typical Congregation Size	20

The church typically used for 3.5 hours per week for the following activities

Services	1 hours per week
Meetings and Church Groups	1.5 hours per week
Community Use	1 hour per week

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

3. Energy Procurement Review

Energy bills for electricity have been supplied by All Saints Church, North Moreton and have been reviewed against the current market rates for energy.

The current electricity rates are:

Day Rate	13.85p/kWh	In line with current market rates
Night Rate	12.08p/kWh	In line with current market rates

The above review has highlighted that the current rates being paid are in line or below current market levels and the organisation can be confident it is receiving good rates and should continue with their current procurement practices. The church may wish to consider reviewing 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

All Saints Church, North Moreton uses 4,680 kWh/year of electricity, costing in the region of £565 per year.

This data has been taken from the annual energy invoices provided by the suppliers of the site (see Appendix 2). All Saints Church, North Moreton has one main electricity meter, serial number E17UP09523.

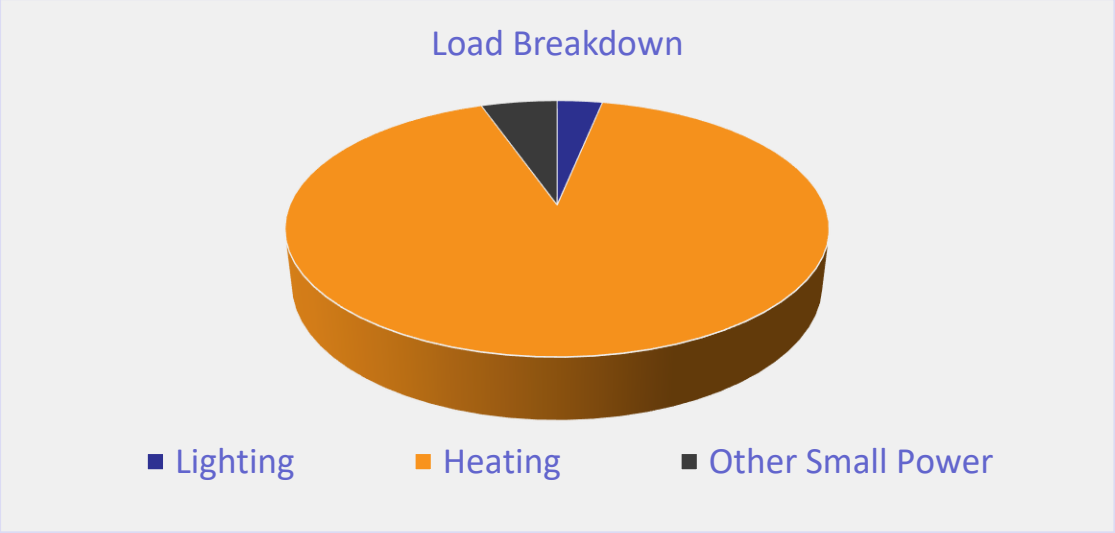
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – Church	E17UP09523	3 phase 100A	Yes	Under tower in vestry cupboard.

All the meters are AMR connected and as such energy profile for the entire energy usage should be possible. Half hour meter data has not been provided for the purpose of this report but could be requested from the supplier.

Energy Profiling

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

Service	Description	Estimated Proportion of Usage
Lighting	All LED lighting throughout the church	3.2%
Heating	Heating via overhead radiant heaters and some other heaters in places.	91.4%
Other Small Power	Organ, plug in appliances etc.	5.4%



As can been seen from this data, the heating makes up by far the largest proportion of the energy usage on site.

Energy Benchmarking

In comparison to national benchmarks for Church energy use All Saints Church, North Moreton uses 91% less energy than would be expected for a church of this size.

	Size (m^2 GIA)	All Saints Church, North Moreton use kWh/m^2	Typical Church use kWh/m^2	Efficient Church Use kWh/m^2	Variance from Typical
All Saints Church, North Moreton (elec)	314	4,680	14.88	20.00	-26%
All Saints Church, North Moreton (heating fuel)	314	0	0.00	150.00	-100.00%
TOTAL	314	4,680	14.88	170.00	-91%

This church is already a very energy efficient church and, in comparison with other churches, it used much less energy than would be expected. The recent conversion to LED lighting results in there being no further savings that can be achieved by this. Being a rural church used predominantly for Sunday worship only there is little other energy usage other than heating and lighting. It is therefore the heating where improvements can be made. It should not be expected that substantial energy savings can be achieved from improving the heating, but the church should be able to expect to be able to create a more comfortable environment for the same energy input. The rest of this report therefore focuses solely on the recommendations to improve the heating for the church in the most efficient manner.

5. Heating Improvement Recommendations

Use of Electric Panels for Heating Specific Areas only

There is currently no heating to the vestry or to the altar area to provide comfort to the clergy. There are also overhead units within the Stapleton Chapel which is infrequently used. It is recommended that the PCC consider installing electrical panel heaters in these areas on a time delay switch. With the vestry it is recommended that the heating panel is located on the ceiling and to the altar area it can be located behind the altar, so it is not visible from the body of the church.

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.

We would therefore suggest that the following works are considered:

- Install 1 nr 350W Platinum Ceiling panel heater from Warm4Less mounted on the ceiling of the vestry and wired back to the near by electricity distribution boards in FP200 Gold cable. Heater to be switched with a Danler 159 TLSW timelag switch.
- Install a 1200W far IR panel heater (a Warm4Less 1200W Platinum Panel) mounted on the wall behind the altar and wired in FP200 Gold cable. Heater to be switched with a Danler 159 TLSW timelag switch.
- Install three 1200W far IR panel heater (a Warm4Less 1200W Platinum Panel) mounted on the walls of the Stapleton Chapel and wired in FP200 Gold cable. Heater to be switched with a Danler 159 TLSW timelag switch.

Under Pew Heaters

Given the churches usage profile we would suggest that a revised heating strategy for the church would provide a much more efficient use of energy and a more comfortable church. The current high level infra-red heaters are mounted too high to be effective in warming the congregation and emit an unpleasant red glow.

As with most medieval churches, this church would have survived most of its life without any form of heating. The modern additional of heating is not needed to preserve the fabric but only to provide thermal comfort to occupants. The previous trend of 'conservation heating' for fabric issues is now largely considered to be unnecessary and is being avoided by the likes of National Trust and English Heritage.

There are existing tube heaters under the pews, but these are reported to be largely redundant and not used. For replacement, two most popular under pew heaters within churches are BN Thermic PH65 heaters (http://www.bnthermic.co.uk/products/convection-heaters/ph/) or similar from http://www.electricheatingsolutions.co.uk/Content/PewHeating.

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

Install BN Thermic Under Pew Heaters suspended from brackets from the underside of the pew seat as follows:

North side, 7 rows with two PH65 heaters in each row between uprights

South side, 5 rows with three PH45 heaters between uprights and 2 rows with two PH65 heaters.

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

The eight high level radiant heaters within the nave should be removed completed with all associated cabling back to the distribution boards.

The new installation would provide a small energy saving as the existing power is 24kW (8 x 3000W = 24,000W) and the new power is 18.45kW (14 x 650W + 15 x 450W + 4 x 650W = 18,450W).

A similar installation could be fitted to the choir stalls if so, desired which would consists of

Install eight PH65 BN Thermic Under Pew Heaters suspended from brackets from the underside of the choir stall seats.

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

The high-level radiant heaters within the chancel should be removed completed with all associated cabling back to the distribution boards.

Additional Heating

In order to achieve the sense of a 'warm welcome' into the church an over door air heater could be provided. This would also help to provide warmth to the rear of the church up to and include the font. Such an over door unit should be sized to cover the whole width of the door and it is suggested the BN Thermic 860 model would be quite suitable. This has a 6kW output and the existing 3kW high level radiant above the door should be removed and when considered with the saving in moving from overhead to under pew in the main nave the additional power of the overdoor heater is more than offset by this. The installation would therefore be:

Install a BN Thermic 860 Overdoor Fan heater above the main entrance door wired in with a BN Thermic CS-7 control switch. The unit requires single phase power which should be taken from the existing supply to the overhead radiant heater above the door which should be removed. All new cabling to be run in FP200 Gold.

Relocate the existing emergency lighting above the new overdoor air heater in the location of the existing overhead radiant heater which is to be removed.

If additional heating is required to the servery area after the over door fan heater is installed, then the use of underplinth 'kick space' heaters under the units should be considered. Both these types of heaters use a fan and therefore have a fan noise. These can be turned down to low speed to minimise this, but the use of these heaters is mainly for before and after the service and should be expected to be turned off during the service.

The church may still experience some cold spots which require spot heating for specific purposes (i.e. attendants at the arts fair, a winter bride at the chancel step or a music performer), in these circumstances we would suggest that the use of a temporary tripod mounted heater would be most appropriate. These temporary heaters can be purchased widely and BN Thermic offers some products in this area. The key to the successful use of these is to have plug sockets located near where the heaters may be required to avoid the need for trailing leads. The church is relatively well served for sockets in most places, but an additional socket wired in under the pulpit area could prove to be advantageous.

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.

6. 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
Battery Storage	Yes
Wind	No
Micro-Hydro	No
Solar Thermal	No
Ground Source Heat Pump	No
Air Source Heat Pump	No
Biomass	No

There is potential for a small PV array on the roof of the tower or on the roof of the Stapleton chapel. The current arrangements around solar panels mean that to be financially viable the building on which they are mounted needs to consume the vast majority of the energy that they produce. The churches energy consumption is already very small and the consumption during the daytime when the sun is shining is likely to be very low indeed, therefore while technically viable only a very small number of panels (maximum of around 4) would be worth considering if at all.

Battery Storage is not strictly a renewable energy solution, but battery storage does however provide a means of storing energy generated from solar PV on site to be able to be used at peak times or later into the day when the PV is no longer generating. It therefore extends the usefulness of the existing PV system particularly in this sort of church. This is a new but fast-growing technology with prices expected to fall substantial over the next 2 to 3 years therefore investment into this may be worth delaying at this stage.

7. 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. This could be used to fund the purchase of a trial under pew heater.

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.

8. 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.