Energy Opportunity Survey for St John the Evangelist, Kingston Park

Green Journey

Energy Opportunity Survey

Green Journey

Introduction

Green Journey has been authorised by the Diocese to carry out energy surveys and provide churches with the opportunity to join the Green Journey energy scheme. The aim is to reduce the carbon footprint and where possible energy costs of all churches within the Diocese and across the wider Church of England.

Green Journey's buying power allows us to offer renewable energy at a similar, or lower, price to standard energy. This allows all churches opting into Green Journey to practise responsible stewardship, whilst also making a saving. Green Journey can help you in your stewardship by reducing your electricity and gas bills, whilst also providing a report detailing your church's energy consumption and sustainability, advising on how both can be improved.

"To date, Green Journey has saved Churches in England over £420,000 in energy bills and VAT reclaims."

Reducing our energy consumption and cutting carbon dioxide emissions is of paramount importance for all, as together we must face the effects of climate change. The Church of England is a leading advocate of sustainability awareness and action, with all levels of the Anglican church committing to be carbon neutral by 2030.

Consumption figures presented in this report are calculated from billing figures and information collected during the energy survey. An estimation of your electricity consumption breakdown is also included, for example lighting could be projected to comprise 60%, kitchen appliances 30% etc. Due care has been given to ensure that these are as close to the observable figure as possible, however these should be considered as calculated approximations only.

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Site Summary

Site Address	
Church Name	St John the Evangelist
City/Town	Kingston Park
Postcode	NE3 2HB

Site Contact	
Contact	John Gardener
Email	jcrgardener@gmail.com

Audit Information	
Auditor	Glen Clement

Report Information	
Report Author	Glen Clement

Summary of Recommendations

Recommendation	Benefit
LED Lighting	Reduced lighting based consumption
Boiler Capacity Review	Correctly sized heating system
Window Opening Mechanism (Upstairs Office)	Improved comfort levels
Improved Door Insulation	Reduced heat loss
Endotherm	Improved heat transfer within the heating system
Green Procurement	Reduced energy consumption from purchased products i.e. white goods , IT equipment etc.
Energy Saving Strategy	Provides a formalised approach to energy management
Net Zero Strategy	Provides a formalised approach to achieving Net Zero

In addition to the above, there is also a renewables appraisal located on pages 7 to 9.

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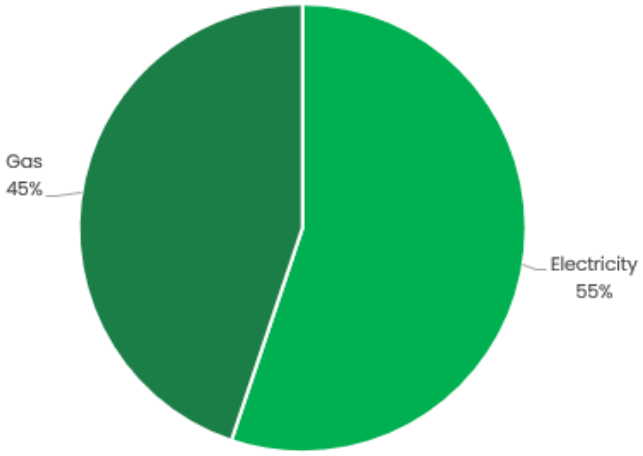
Energy Overview

Energy Breakdown

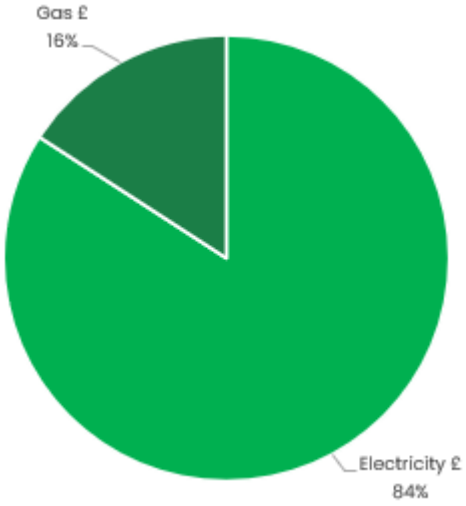
Electricity	
Electricity Usage (kWh)	12,117
Cost per Annum (£)	£1,840.05
Meter Quantity	1

Gas	
Gas Usage (kWh)	9,854
Cost per Annum (£)	£346.66
Meter Quantity	1

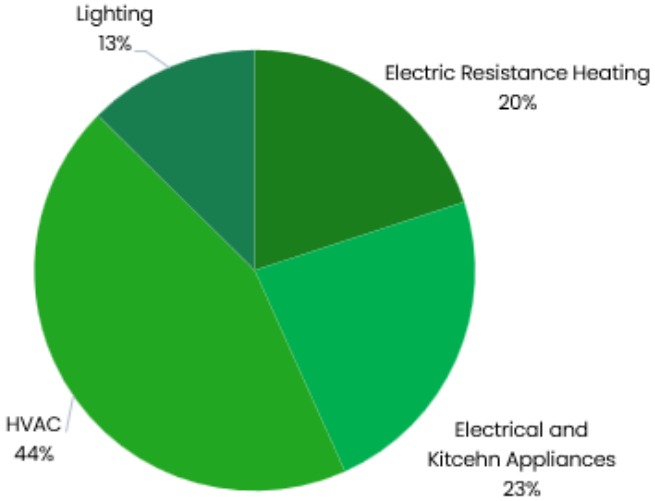
Total Energy Breakdown



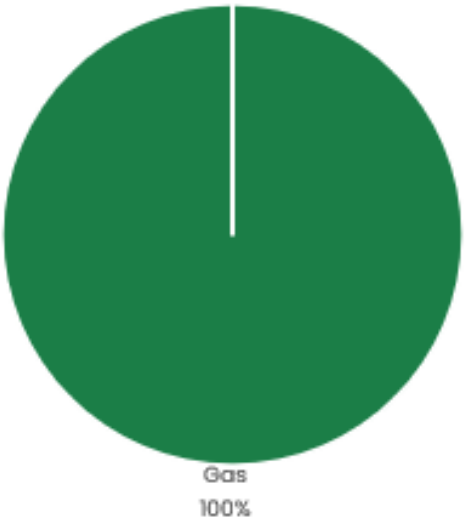
Cost Breakdown



Electricity Breakdown



Gas Breakdown



N.B. Breakdowns are based on observations made at the site and discussions with the church representative during the site visit.

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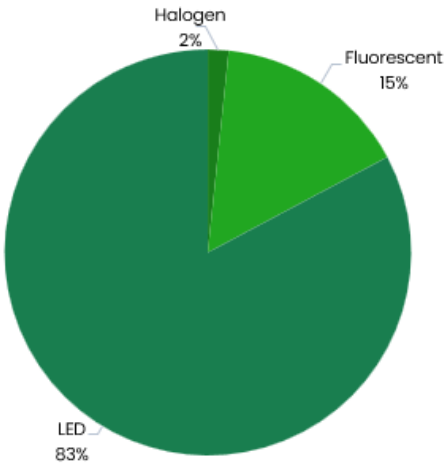
Description of Energy Consumers

Space Heating and DHW

Heat Source	Area Served (Heating)	Area Served (DHW)	Controls	Heat Delivery
Potterton Kingfisher	Whole church	NA	In-built, TREND BMS	2 x AHU, radiators
2 X AHU	Main Hall	NA	TREND BMS	Vented
Electric Resistance	Upstairs Office	NA	In-built	Direct
2 x Point of Use (POU)	NA	Kitchen, Toilet	In-built	NA

Lighting

In total, lighting contributes 13% of the site's total electricity consumption. Lighting fixtures consist of LED, halogen and fluorescent fittings.



Electrical and Kitchen Appliances

Electrical and kitchen appliances account for approximately 23% of electricity consumption and include but are not limited to:

Dishwasher	Kettle	Projector	Microwave

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Green Energy Supply

Energy Supply

Switching to a carbon neutral gas supply and renewable electricity supply would allow the church to significantly reduce its carbon footprint and enhance it's green credentials.

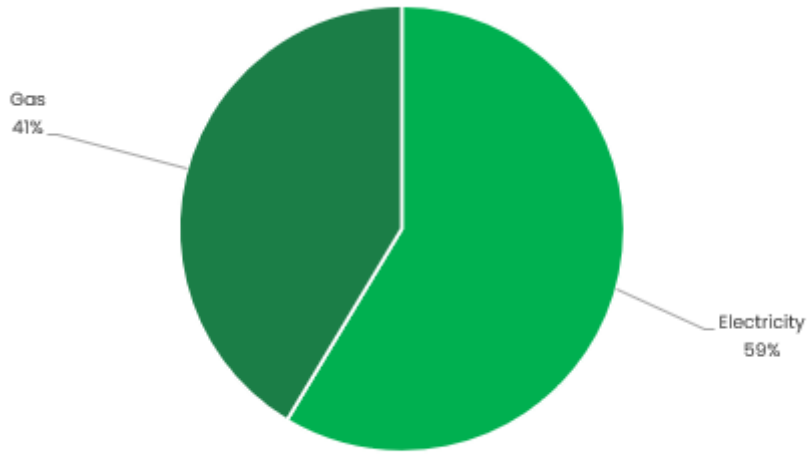
Current Emissions tCO_2e

Current Gas SSE tCO_2^e	Current Electric SSE tCO_2^e	Total tCO_2^e Tonnes
2.6	1.8	4.4

The sites gas use accounts for 2.6 tCO_2e/per annum. It is suggested the church could switch to a carbon neutral gas supply or procures biogas.

The sites electricity supply accounts for 1.8 tCO_2e/per annum. It is suggested that the church could switch to a renewable electricity supply.

Carbon Footprint Breakdown tCO_2e/Annum



Air Source Heat Pump (Air to Water) V's Current Gas Heating

An Air Source Heat Pump (ASHP) works by transferring heat absorbed from the outside air to an indoor space, via wet central heating systems.

In order to operate optimally, either underfloor heating or low temperature radiators are needed to deliver and emit heat effectively. This will therefore mean an upgrade to the current infrastructure as neither are currently present.

As observed below, air source heating can provide a reduction in consumption of 5,912 kWh, 6,569 kWh, 7,039 kWh and 7,391 kWh at SPF's (Seasonal Performance Factor) of 2.5, 3, 3.5 and 4 respectively, compared to the current method of heating.

Annual running costs are however higher at a SPF's of 2.5, 3, 3.5 and 4 respectively.

Heating System Solution	SPF	Energy Saving (kWh)	Annual Running Costs (£)	Difference in Annual Running Costs (£) VS Current System +/- (£)
Air to Water Heat Pump	2.5	5,912	£564.89	+£218.23
	3	6,569	£470.74	+£124.08
	3.5	7,039	£403.49	+£56.83
	4	7,391	£353.06	+£6.39

Conclusions

Incorporating air source heating would require wholescale changes to the heat distribution network.

Energy savings can be made, however, running costs are higher at all SPF's assessed.

The main hall is well insulated, a prerequisite when installing any ASHP system.

Lastly, it should be noted that an ASHP may not meet the heat demand of the site, in this instance a hybrid system would be needed i.e. ASHP supplemented by direct electric heating.

It is advised that a heating engineer is consulted to provided an exacting system design, predicted energy savings and ROI's.

Ground Source Heat Pump

A ground source heat pump (GSHP) harvests solar heat absorbed by the ground. At present, there are two types of collectors; pipe loop horizontal or vertical.

In terms of available area, there isn't adequate space to consider a horizontal system, so this can be discounted, a vertical system would therefore be the only potential option.

In terms of installation, vertical systems require surface boring, something that can be difficult in urban settings. Another consideration is the geological make up of the area, as this can impact the process.

From a heat delivery perspective a GSHP works optimally when underfloor heating is implemented. This will add to the capital cost of the project, as heat is currently delivered via high temperature radiators and 2 x AHU's in the main hall.

In addition to the above, a designated plant room is needed to store the associated heat exchanger, compressor and water cylinder, which again adds to the project CAPEX.

The church's annual heating spend is £346.66, the cost of a GSHP can range from £16,000 to £42,000. When a potential CAPEX of £16,000+ is factored in, a GSHP maybe a non-optimal option from a financial perspective.

Having assessed the above, it is suggested that ground source heating is a non-optimal/viable method of heating for the church.

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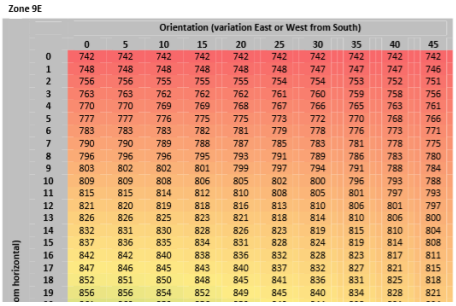
Renewables Appraisal

Renewables Appraisal - Solar PV

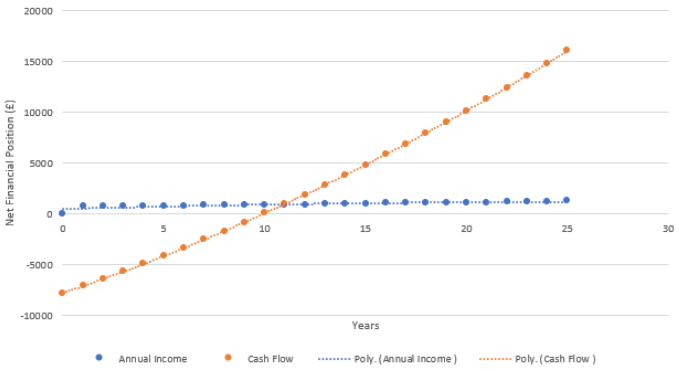
The below provides potential energy and fiscal savings associated with the installation of Solar PV at site.


Zone 9E

Orientation (variation East or West from South)										
0	5	10	15	20	25	30	35	40	45	
0	742	742	742	742	742	742	742	742	742	742
1	748	748	748	748	748	748	747	747	747	746
2	756	756	755	755	755	754	754	753	752	751
3	763	763	762	762	762	761	760	759	758	756
4	770	770	769	769	768	767	766	765	763	761
5	777	777	776	775	775	773	772	770	768	766
6	783	783	783	782	781	779	778	776	773	771
7	790	790	789	788	787	785	783	781	778	775
8	796	796	796	795	793	791	789	786	783	780
9	803	802	802	801	799	797	794	791	788	784
10	809	809	808	806	805	802	800	796	793	788
11	815	815	814	812	810	808	805	801	797	793
12	821	820	819	818	816	813	810	806	801	797
13	826	826	825	823	821	818	814	810	806	800
14	832	831	830	828	826	823	819	815	810	804
15	837	836	835	834	831	828	824	819	814	808
16	842	842	840	838	836	832	828	823	817	811
17	847	846	845	843	840	837	832	827	821	815
18	852	851	850	848	845	841	836	831	825	818
19	856	856	854	852	849	845	840	834	828	821

Orientation (variation horizontal)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12
Cash Flow	-£7,837.50	-£7,129.42	-£6,421.33	-£5,713.25	-£4,938.01	-£4,162.77	-£3,387.53	-£2,545.14	-£1,702.74	-£860.35	£49.20	£958.75	£1,868.30
Year	13	14	15	16	17	18	19	20	21	22	23	24	25
Cash Flow	£2,845.01	£3,821.71	£4,798.42	£5,842.28	£6,886.14	£7,930.00	£9,041.02	£10,152.03	£11,263.05	£12,441.22	£13,619.39	£14,797.56	£16,042.89



Location	Project Cost (£)	Number of Panels	Annual Generation (kWh)	1st Year Total Savings (£)	Payback (Years)	Net Income (25 Years)
South Roof	£7,837.50	23	5,218	£708.00	9.9	£16,042.89

The above is based on an assumed 10% increase in electricity unit rates per 3 year period (year 0– 16086p/kWh). The above provides an estimate of potential generation capabilities and associated financials. A full quotation is required to gain exacting figures and may differ from the figures provided.

The estimated installation cost of Solar PV is £7,837.50, with an associated payback period of 9.9 years, and a full life net income of £16,042.89.

ECM 1 - Boiler Capacity

There are 2 x Potterton Kingfisher, 40kW boilers providing space heating for the site.

It was stated that the church experiences issues with heating lead times (how long the church takes to heat up) and because of this, meetings cannot be organised at short notice. It is suggested that the system maybe underspecified, which would explain the issues in reaching a comfortable temperature.

To resolve, it is suggested that the system heat loss is calculated and compared to boiler heating capacity (this may require the assistance of a heating engineer). From there conclusions can be made as to the appropriateness of the system and the most optimal approach moving forward.

If direct replacements are selected, it is advised that modern condensing options are sought, as they will provide optimal performance from an energy efficiency perspective.

ECM 2 - LED Lighting

Lighting consists of mainly LED fitting's, with sporadic non-LED's present. It is suggested that the remaining fittings are replaced with LED's at end of life, as associated paybacks do not warrant immediate replacement.

ECM 3 - EndoTherm

A product know as EndoTherm can be regularly added to the heating system. This is a liquid that improves heat transfer rate and efficiency, resulting in the system heating up faster and maintaining the determined temperature for longer.

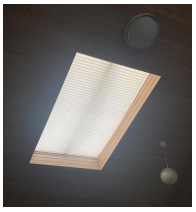
(Please consult Endotherm for instructional advice on how to apply to your system)

ECM 4 - Green Procurement

When referring to future purchasing decisions it is suggested that equipment which has a high energy efficiency rating is purchased. Ratings typically go from “A” to “G” however some appliances, such as fridges and freezers, go up to A+++.

ECM 5 - Window Opening Mechanism

The widows in the upstairs office cannot be opened, causing uncomfortable temperatures within the summer months. It is suggested that an opening mechanism is installed to improve comfort levels. This will also reduce the possibility of supplementary cooling equipment being added (portable fans), which could increase energy consumption.



ECM 6 - Improved Door Insulation

The entrance door is ill fitting causing excess levels of heat loss. it is suggested that appropriately sized draft excluders are installed to rectify this problem.

ECM 7 - Staff Training & Energy Saving Strategy

The below outlines a potential energy saving strategy which is designed to implement the principles of energy management into St John the Evangelist's operations.

Stage of Methodology	Overview
Creating Baselines and KPI's	This will allow for current performance to be quantified and provide quantifiable and verifiable figures to compare improvements against.
Research	Gain an understand of current energy related practices.
Energy Action Plan	Produce strategy to improve energy performance.
Implementation	Implement changes outlined in action plan.
Responsibility	Assign Green Champion and Green Team.
Staff Training and Energy Awareness	Conduct staff training to inform staff of new strategy.
Review	Review of key performance indicators to quantify effectiveness of action plan.

Please see overleaf for a more detailed description of the above.

ECM 7 - Staff Training & Energy Saving Strategy Continued

Stage of Methodology	Components
Creating Baselines and KPI's	This will allow for current performance to be quantified and provide quantifiable and verifiable figures to compare improvements against. Realistic KPI's can also be produced i.e. reduce total annual electricity consumption by 5% against 2019 baseline.
Research	Conduct initial meeting with senior management to discuss current energy related areas i.e., heating of uncopied areas, excessive radiator settings, staff attitudes and education levels relating to energy management.
Energy Action-Plan	This should include specific projects and method to achieve, for example: **Project** - Regulate radiator outputs **Methodology** - Train Staff to set rads to an efficient level Action plans should relate to KPI's outlined above.
Implementation	Implement changes outlined in action plan i.e. modify BMS, install LED lighting.
Responsibility	To ensure action plans are implemented a Green Champion can be appointed as the person with overall responsibility for this. It is also advised that a 'Green Team' is also created. Green Team members can monitor if action plans are being carried out i.e. ensure unoccupied areas are not being lit, efficient radiator settings are being implemented etc. This method provides accountability and therefore increases the potential for action plans to succeed.
Staff Training and Energy Awareness	To aid the above staff training can be carried out to inform all staff members of the sites energy strategy. This can be done in a presentation format outlining the fundamentals of the scheme, describing green initiatives and introducing the Green Champion and team. Progress presentations/meetings can also be implemented to update staff on achievements or areas for improvement. Lastly, Green strategies can be communicated in future staff inductions to provide an understanding of the scheme from the outset.
Review	Conduct regular review meeting to:- track performance against KPI's, quantify effectiveness of action plans , highlight successes, identify areas for improvements and modify the strategy where necessary.

ECM 8- Net Zero Strategy

If no plan is already in place, it is advised that a 'Net Zero' strategy is developed in order to aid your transition to net zero carbon emissions by 2030. This will allow the development of targets and specific action plans around different areas of focus.

As part of the net zero strategy it is recommended that a 'Green Champion' is appointed. The 'Green Champion' can monitor progress towards achieving net zero emissions and also take responsibility for implementing action plans i.e. ensuring unoccupied areas are not being lit, computers are turned off outside of hours of office use etc.

Further ways in which you can work towards achieving your net zero goal can be found within the following Diocesan and Church of England webpages;

- Newcastle Diocese Environmental Pages - https://www.newcastle.anglican.org/mission/environment
- Church of England's 'Practical Path to Net Zero' - https://www.churchofengland.org/resources/churchcare/net-zero-carbon-church/practical-path-net-zero-carbon-churches

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Green Journey Contacts

For more information on the areas discussed with this report or for assistance in the procurement and installation of any of the energy saving opportunities, please contact us via the following channels:

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