

Energy Opportunity Survey

Christ Church, Harrogate, HG1 4SW

Green Journey

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 THE CHURCH
OF ENGLAND

Diocese of Leeds

Energy Opportunity Survey

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Energy Opportunity Survey

Green Journey has been appointed by the Diocese of Leeds to carry out energy surveys and provide churches with the opportunity to join the Green Journey energy basket. The aim is to reduce the carbon footprint and energy costs of all churches within the Diocese of Leeds 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, while 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,

“To date, Green Journey has saved the Church of England over £237,000 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, promoting a more environmentally conscious stewardship at local, regional and national levels.

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 Overview

Site Address		Site Contact	
Church Name	Christ Church	Contact	
Town	Harrogate	Telephone	
Postcode	HG1 4SW	Email	

Audit Information		Site Information	
Auditor	Andrew Rogers	Annual Operating Hours	2,404
Audit Date	28/06/2018	Square Meters	1,134
Audit Time	14:30	Congregation Number	250

Report Information	
Report Author	James Fairbairn
Date	25/07/2018

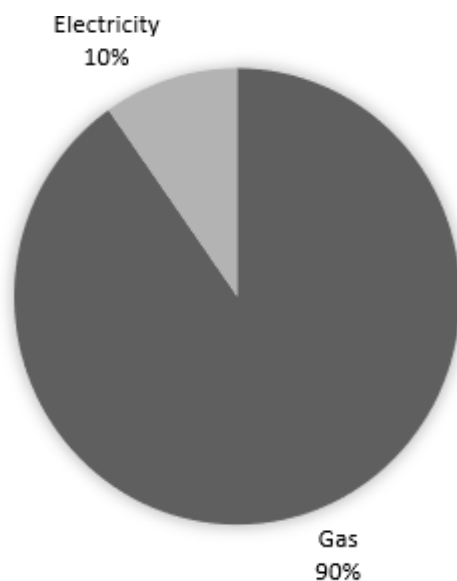
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Energy Overview

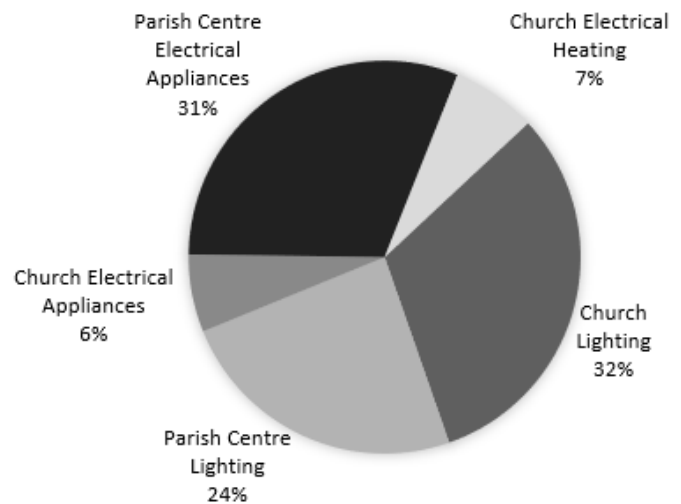
Energy Breakdown

Electricity		Gas	
Period Covered	June 17— May 18	Period Covered	June 17— May 18
Electricity Usage (kWh)	21,139	Gas Usage (kWh)	194,887
Cost per Annum	£2,595.24	Cost per Annum	£5,693.04
Meter Quantity	1	Meter Quantity	1

Total Energy Breakdown



Electricity 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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The following paragraphs contain information on the energy efficiency and sustainability of your church. This draws on observations made on, but is not limited to, building structure, lighting and space heating (such as boilers, electric heating). All recommendations provided within the report are intended to help your church streamline its energy consumption, reducing costs and ensuring the sustainability of your church is as near to what is deemed to be practically feasible. For example, churches that replace inefficient lighting with LED fixtures have observed on average, an 80% saving in lighting costs.

If you would like further advice on any of the recommendations made here, please get in touch and we will be happy to assist. We advise that you also speak with either the DAC Secretary or your Archdeacon to ascertain if a Faculty decision will be required, and if so to find out how your PCC should proceed.

Main Heating - Gas

It is often challenging to find the correct temperature to heat your church. The following guidelines are provided based on our experience and if followed can help preserve the long-term structural integrity of your church.

Occupancy	Temperature (°C)	Comments
During a church Service	18-21°C	Most suitable temperature for the congregation during a service
Open Door (if the church remains open to the public throughout the day)	12°C	Comfort Temperature
Vacant/Overnight	8°C	Minimum temperature for reducing surface and interstitial condensation of the church building

However, it is acknowledged that financial restraints may not allow for a minimum background temperature of 8°C to be followed at all times.

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Main Heating - Gas

The following information in this section highlights implementations which could be given consideration, in order to improve heating efficiency of your church. Should you wish to act upon any of the following suggestions you should first consult your Diocese Heating Advisor.

Location	Boiler Model	Quantity	Estimated Efficiency	Output (kW)	Condensing
Parish Centre	Vaillant VU GB 656/4-5-A	1	85%	65	Yes
Church Crypt	Buderus logarno plus GB312	1	75%	200	Yes

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

We would advise that magnetic and sediment filters be installed, to prevent small metal particles and debris leading to corrosion in your heating system, or at worst, a central heating breakdown. This debris can be extracted with a magnetic and sediment filter, thus protecting the heat exchanger and improving the lifespan and efficiency of your boiler.

We would advise that EndoTherm is regularly added to the water in the radiators of your 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.

We would advise that a further investigation be undertaken to determine whether the set flow temperature of your condensing boiler could be reduced. Condensing boilers harness the heat energy encapsulated within the boiler flue gases, however, this cannot happen if the return temperature is above 57°C. As the flow and return temperatures are linked, reducing flow temperature could enable your boiler to achieve greater efficiencies up to and around 90%.

It is our understanding that it can be sometimes challenging to prevent tampering with timers and controls which can therefore result in energy wastage. This can be avoided by appointing an 'energy champion' who is responsible for programming the controls. It may also be necessary to install a tamper-proof box where continual interference is a common theme. In our experience, churches that have followed this advice have benefitted from reduced energy bills.

Heating System Solution	Litres	Cost (£)
EndoTherm	15	£900

Heating System Solution	Cost	Annual saving	Payback (years)
Magnetic & Sediment Filters	£439	£421	1.03

Note: As your site has two boilers, this has been taken into account in the above costings/savings.

EndoTherm

Awards Won

H&V News Awards 2015 – Domestic H&V product of the year

Ecobuild 2015 – M&S big innovation pitch winner

CIBSE Building Performance Awards 2016 – energy saving product of the year

National Energy Efficiency & Healthy Homes Awards 2017 – product of the year

About It

EndoTherm is 100% organic and saves up to 15% of energy that is used. As well as this it is a non-corrosive substance that works within an hour with a CO2 payback of a day and a ROI of less than a year. EndoTherm works in any seal, wet heating system.

How It Works

It reduces surface tension of water.

Makes water more 'wet' by breaking up the hydrogen bonds so it is able to reach all the imperfections of the systems surface.

Improves the thermal properties of the water to increase efficiency of the heating system.

Systems heat up quicker.

Stay hotter for longer.

Only need to use a 1% concentration in comparisons to system size.

Independent Studies

Enertek International

- A privately owned R&D company who work on behalf of major multinational corporations, leading private companies, trade associations, and government departments.
- Direct comparison tests with and without EndoTherm in the system water indicate that the gas consumption of the boiler in the heating system can be reduced by up to 15%. This empirical evidence indicates that the addition of EndoTherm can significantly reduce gas consumption and therefore CO2 emissions".

University of the West of Scotland

- A collaboration between the Innovation & Research Office (UWS), the Institute of Biomedical & Environmental Health Science (IBEHR), and their partners was conducted to investigate the impact of EndoTherm as an energy saving technology.
- Surface Tension measurements using K11 Kruss Force tensionmeters confirmed a reduction in

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Heating Controls

The overall efficiency of a heating system is based on three factors: the efficiency of the boiler, the type of fuel used and the responsiveness of the controls. It is often the latter of these that gets overlooked. Appropriate controls will ensure that a heating system is only in use when actually needed; saving money, reducing carbon emissions and maintaining the correct comfort level.

There are many varieties of controls, but they all control the timing of the heating system and/or the demand temperature required. Traditionally, a heating system would be fitted with a programmer (a clock device with "on" and "off" periods) and a room thermostat (that monitors the air temperature in the church). There are now many automated devices that can offer these from a remote location, called "smart controls" such as Nest, Hive and Evohome.

In addition to the above, modern controls include thermostatic radiator valves (TRVs), programmable TRVs, zone control, boiler energy managers, weather compensators and load compensators.

In real terms, the three most cost effective controls in building's and church halls, depending on the heat demand and budget available are:- boiler energy managers, programmable room thermostats and TRVs.

However, a note of caution. The pipework of old heating systems may not be configured to take modern controls. We would be happy to carry out a detailed survey and advise further, but would also recommend consultation with your Diocesan Heating Advisor.

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Energy Supply and Metering

Switching to a green supply would allow Christ Church to significantly reduce its carbon footprint and enhance its sustainable image.

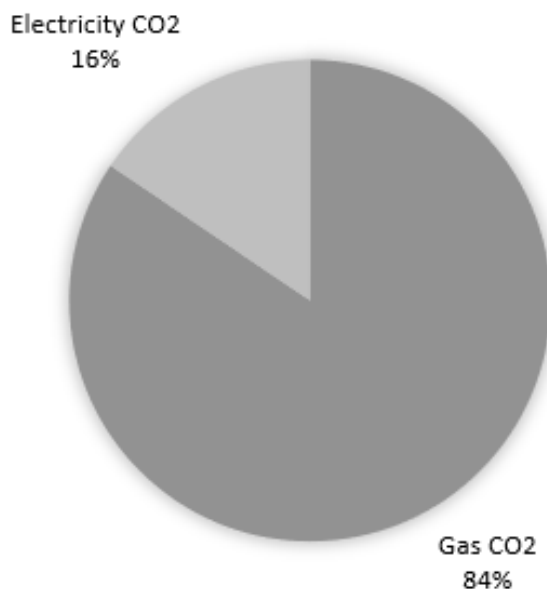
Green Electricity & Carbon Neutral Gas

Currently Christ Church purchases electricity from E-ON (21,139 kWh/annum) and gas from CNG (194,887 kWh/annum).

Electricity E-ON kg of CO ₂ per kWh	Gas CNG kg of CO ₂ per kWh	Total Christ Church tonnes of CO ₂ per annum	Green Journey Churches Average (tonnes)
0.298	0.184	42.19	18.02

Christ Church electricity supply accounts for 6.60 tonnes of CO₂ per annum, thus it is recommended that the church switches to a 100% green electricity supply.

Christ Church gas supply accounts for 35.89 tonnes of CO₂ per annum, thus it is recommended that the church switches to a 100% carbon neutral gas supply.

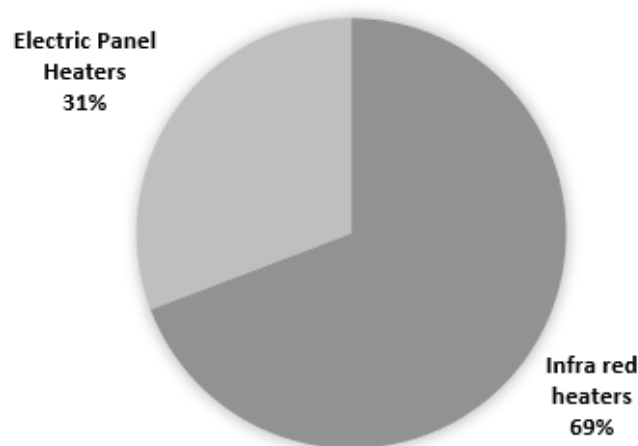


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The church has 9 infra red heaters and 2 electric panel heaters which account for 7% of the total electricity consumption. Electric heating is in use during church services and events throughout winter.

We would advise that timer switches be installed on the heaters in order to reduce energy consumption by ensuring the heater is only operated when required.

We would advise that the scheduled usage of the heaters be examined to identify any potential reductions in electricity consumption. For example, if the church has two events on per week and is otherwise unoccupied, it would be prudent to ensure that the electric heater usage accurately reflects this. By closely coordinating the church's schedule with electric heater usage it may be possible to optimise your heating system and subsequently reduce your consumption.



Please note, that if you wish to make any changes to your current heating system you should first consult your Diocese Heating Advisor.

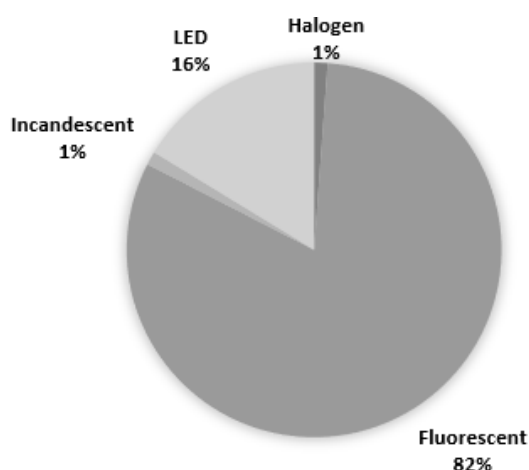
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Lighting

In total, lighting contributes 56% of the site's total electricity consumption. Lighting fixtures within the church are predominantly fluorescent lights, for example the 58 26W fluorescent bulbs.

We would advise replacing the existing light fixtures with light emitting diode (LED) equivalents. This could manifest as a proactive LED retrofit scheme or as a reactive scheme whereby current fixtures are only replaced at the end of their working life.

It is suggested that the 26W fluorescent bulbs be prioritised for replacement. Although fluorescent lighting is efficient compared to halogen/incandescent lighting, further efficiencies can be yielded by replacing it with an LED equivalent. As an illustration, 26W fluorescent bulbs can typically be replaced by 6W LED equivalents. Thus, the same quality of light can be produced by an LED equivalent with a 76% reduction in energy consumption being observed.



LED Lighting Savings

A costed LED retrofit project for your church has been provided below to present the potential energy and monetary savings. Annual costs can also be substantially reduced through lower maintenance costs. During many energy surveys Green Journey has carried out it has often been mentioned to us that light fittings are sometimes left in a state of disrepair until it becomes commercially viable to replace all malfunctioning fittings at the same time. As such, LED lighting represents a sound investment from both an energy saving and a maintenance perspective, especially when taking into consideration its lifespan of up to 50,000 hours. This compares favourably to the 2,000-4,000 hours observed in halogen fittings.

Replacement Cost (£)	Annual Spend (£)	Purposed Spend (£)	Saving (£)	Payback (Years)
£3,497.46	£1,388.84	£538	£850	4.1

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Renewables

Solar Photovoltaic Electricity (Solar PV)

Because of the location of the Grade II listing it would be inappropriate to consider the installation of solar PV panels.

Biomass

When the gas grid is unavailable, particularly in rural areas, wood fuelled systems, called biomass, are often a cost effective and environmentally friendly option.

Biomass is regarded as a low carbon form of heating as the carbon dioxide emitted when the wood is burned is assumed to be the same amount that was absorbed over the tree's life when it was growing. The process is regarded as sustainable if new trees continue to be planted in place of those used for fuel.

Biomass boilers often tend to be more expensive to install compared to their oil-fired equivalents; however, they may attract Renewable Heat Incentive (RHI) payments that could help offset the initial capital cost.

Ground and Air Source Heat Pumps

Heat pumps absorb heat from the air or ground around a property and convert it to usable heat that can be used in radiator, or preferably, underfloor heating systems. Like biomass systems, heat pumps may be a viable option when there's no access to the mains gas grid, however, a reliable electricity supply is essential.

Heat pump systems could qualify for RHI payments and may reduce carbon emissions, depending on which fuel is being replaced.

Green Journey is able to provide specialist advice on the above technologies and RHI payments.

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Appliances & Windows

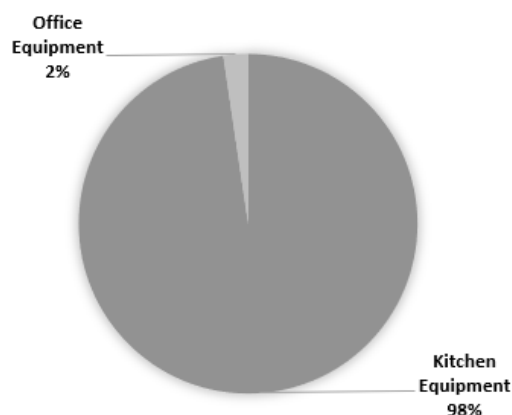
Appliances

In total, Kitchen appliances contribute 98% of the site's total electricity consumption. Office equipment contribute 2% of the site's total electricity consumption

We would advise ensuring that there is at least a 2 inch gap between the wall and your fridge/freezer. This will ensure that the device efficiently releases heat, meaning less energy will need to be used to keep the appliance interior cool.

In order to yield reductions in appliance energy consumption, we would advise that the church ensures that appliances have a scheduled switch off time. This could be achieved by installing plug timers on the wall sockets, this acts as a failsafe should the appliances accidentally be left on.

Furthermore, we would advise that, where finances permit, the church seeks to purchase only equipment which has a high energy efficiency rating. Ratings typically go from "A" to "G" however some appliances, such as fridges and freezers, go up to A+++.



Windows

The windows at the church feature single glazed fittings.

It is understood that due to the restrictions on this Grade II listed building it is not deemed possible to improve over the current windows without consent, due to the Planning (Listed Buildings and Conservation Areas) Act 1990.

However, it may be possible to improve the areas around the windows. For instance, make sure that there are no gaps between the fixture and the wall as this could be a source of heat loss within the building.

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Summary of Costed Recommendations

Recommendation	Litres	Cost (£)
Endotherm	15	£900

Recommendation	Cost	Annual saving	Payback (years)
Magnetic & Sediment Filters	£429	£428	1.03
LED Lighting	£2,723.46	£850.37	3.2

Summary of Non-Costed Recommendations

Recommendation	Benefit
Install timer controls for electric heaters	This will ensure your church is only heated within the times of scheduled church usage.
Investigate the possibility of reducing the set-flow temperature of the condensing boilers.	The boilers may be able to achieve greater efficiencies.
Install a tamper-proof box for boiler controls.	This will ensure that only authorised people can programme the boilers' timer and thermostat.
Maintain areas surrounding the windows	Ensure that there are no damaged areas around the windows that could be a source of additional heat loss.
Adopt an energy efficient procurement policy	Replace existing appliances with more energy efficient alternatives at the end of their working life.
Appoint an 'Energy Champion'	Appoint someone to ensure appliances and energy consumers are switched off when not needed.
Solar PV	This would allow the generation of renewable power on site and provide a certain degree of independence from the national electricity grid.

Further advice can be found from the Diocesan Environment Officer or visit the Environment pages on the Diocesan Website. Your Diocese Heating Advisor should be consulted before any heating recommendations are to be acted upon.

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Water Overview

As of 1st April 2017, the water market in England became deregulated. This allows non-domestic entities to switch water suppliers. Green Journey is delighted to be able to provide water efficiency and procurement services to churches. It is important to note that your church's water consumption will be billed based on one of the two tariffs outlined below:

- **Non-metered Value** – In this case, your consumption is estimated based on an estimated water consumption, in addition to a Rateable Value (RV) attributed to your church. RV is a value given to all churches in the U.K based on the area and operation of the church.
- **Metered Value** – In this case, volumetric consumption data can be recorded and transmitted to your water supplier, this may also extend to surface water/sewerage charges, where a secondary water meter exists.

For more information on the above, please get in touch with Green Journey whom can help you secure the most competitive water rates. In the meantime, there are a number of ways your church can improve its water consumption, as detailed below.

Rainwater Harvesting - This involves rain water being collected in outside tanks, which can then be reused. This will reduce the volume of water the church uses, as they can harness rainwater for usage in urinals/toilets and other greywater facilities. As such, your church will require less water by volume, allowing it to improve its water efficiency.

Tap Aerators - Tap aerators can reduce water supply rates by as much as 60% per minute. Older taps, such as those installed within church's, supply water at an average rate of 15 l/m, compared to 6 l/m when having an aerator installed. This will reduce your annual water consumption, especially where your kitchen and toilet areas are in frequent use. Aerators can be installed on most taps; Green Journey can facilitate this should your church wish to go ahead with it.

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There are an array of funding mechanisms available to churches to make alterations to its building structure, undertake crucial maintenance work and to improve on current energy efficiency. Our in-house team can assist your church in applying for such funding, ensuring that you will have the best chance of being successful in your application.

Listed Places of Worship (LPW) Grant Scheme

This scheme allows eligible churches to claim back VAT on qualifying services and products it purchases. It is only aimed at listed church buildings which provide public religious services at least six times each year. Qualifying services and products are detailed in depth in LPW guidance, however the key areas that qualify for this grant are identified as: electrical (including energy efficiency improvements) and structural works, aesthetics improvements, plumbing (including heating systems). Funding is accessible via two separate routes:

- Projects with a value of £500-£1000 (only one application can be submitted per year)
- Projects >£1000 (an unlimited number of applications can be submitted in this category)

Heritage Lottery Funding

Available since September 2017, this supersedes the “Grants for Places of Worship” programme. 100% of funding can now be applied for via:

- “Our Heritage” scheme (up to £100k)
- “Heritage Grants” (up to £5million)