ESOS-ENERGY
Energy efficient solutions

Energy Efficiency and Zero Carbon Advice

Launde Abbey

Launde Abbey

Author	Reviewer	Date	Version
Matt Fulford	Marisa Maitland	9th May 2021	1.0

Contents

1. Executive Summary

An energy survey of Launde Abbey was undertaken by ESOS Energy 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. This audit has been provided in conjunction with 2buy2, the Church of England's Parish Buying scheme provider and is subsidised from Total Gas & Power, the Parish Buying schemes principal energy suppliers.

Launde Abbey is residential Christian retreat, training and conference centre with a public café. There is electricity supplied to the site but no mains gas. The site uses a mixture of biomass, oil and LPG for its heating.

The centre 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 and the route to net zero carbon are 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 (years)	Permission needed	CO2 saving (tonnes of CO2e/year)
Procure 100% renewable electricity	N/A	N/A	N/A	N/A	N/A	*44.25*
Consider install Electric Vehicle Charging Points	0	N/A	£2,500	N/A	Listed planning	N/A
Insulate exposed pipework and fittings in plantrooms	33,711	£1,618	£1,800	1.11	None	0.52
Add secondary glazing or replace windows to conference room and coach house	6,755	£405	£8,000	19.74	Listed planning	1.81
Install SavaWatt devices on fridges and freezers	2,640	£389	£810	2.08	None	0.67
Install a Ground Source Heat Pump into the building to replace existing heating system	458,471	£10,600	£230,000	21.70	Listed planning	38.05
Refurbish timber windows with Ventrolla system	40,116	£1,926	£60,000	31.16	Listed planning	0.62
Top up roof insulation from 100mm to 270mm	28,654	£1,719	£9,223	5.36	None	7.67
Change existing lighting for low energy lamps/fittings	1,164	£172	£1,179	6.87	None	0.29
Insulate between drawing room and lounge floor and cellar below	5,731	£275	£2,000	7.27	Listed planning?	0.09
Replace hot water system for electrical based heating solution	80,907	£3,884	£36,000	9.27	None	-

The church should check any faculty requirements with the DAC Secretary at the Diocese before commencing any works. It has been assumed that only the Church is subject to Faculty jurisdiction and the remainder of the building would require listed planning consent.

Based on current market prices of 14.75p/kWh, 6p/kWh and 4.8p/kWh for electricity, biomass and oil respectively.

If all measures were implemented this would save the centre £20,988 per year and reduce its carbon footprint by 49.72 tonnes (62%).

2. The Route to Net Zero Carbon

Our Government has committed to move towards Net Zero Carbon – the point at which we have reduced emissions as much as we can and then balanced any residual emissions through removal of carbon from the atmosphere. They have done this as part of a worldwide agreement which aims to limit global warming to well under 2 degrees Celsius, with an aim of keeping it below 1.5 degrees Celsius. This will help protect all of us from the impacts of climate change.

In February 2020, the Church of England's General Synod set its own Net Zero Carbon target. The first stage of this target covers energy used by churches, cathedrals, schools, vicarages, other church buildings, as well as emissions caused by reimbursed transport. The target date is 2030.

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 Launde Abbey to give them 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 Launde Abbey, Launde Road, East Norton, Leicester, LE7 9XB was completed on the 6th April 2021 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.

Launde Abbey	
Church Code	619337
Gross Internal Floor Area	Unknown m^2
Listed Status	Scheduled Ancient Monument

The centre is a residential centre therefore in 'normal' times the building is in occupation 24/7. Note that the audit was undertaken during a COVID lockdown period when the centre was unoccupied.

4. Energy Procurement Review

Energy consumption figures have been provided but no copy bills were provided as part of the audit and therefore a review of the energy procurement has not been able to be undertaken.

5. Energy Usage Details

Launde Abbey uses 174,766 kWh/year of electricity, costing in the region of £25,780 per year, 225,171kWh of oil, costing in the region of £13,510 per year, 10,302 kWh of LPG costing in the region of 464 per year and 438,749kWh of biomass costing in the region of £21,000 per year. The total carbon emissions associated with this energy use are 113.53 CO_2e tonnes/year.

This data has been taken from the annual energy consumption figures provided by the centre. In order to assist with future assessments of the carbon footprint a copy of this spreadsheet has been provided back to the centre with a carbon footprint calculation added. Launde Abbey has two main electricity meters.

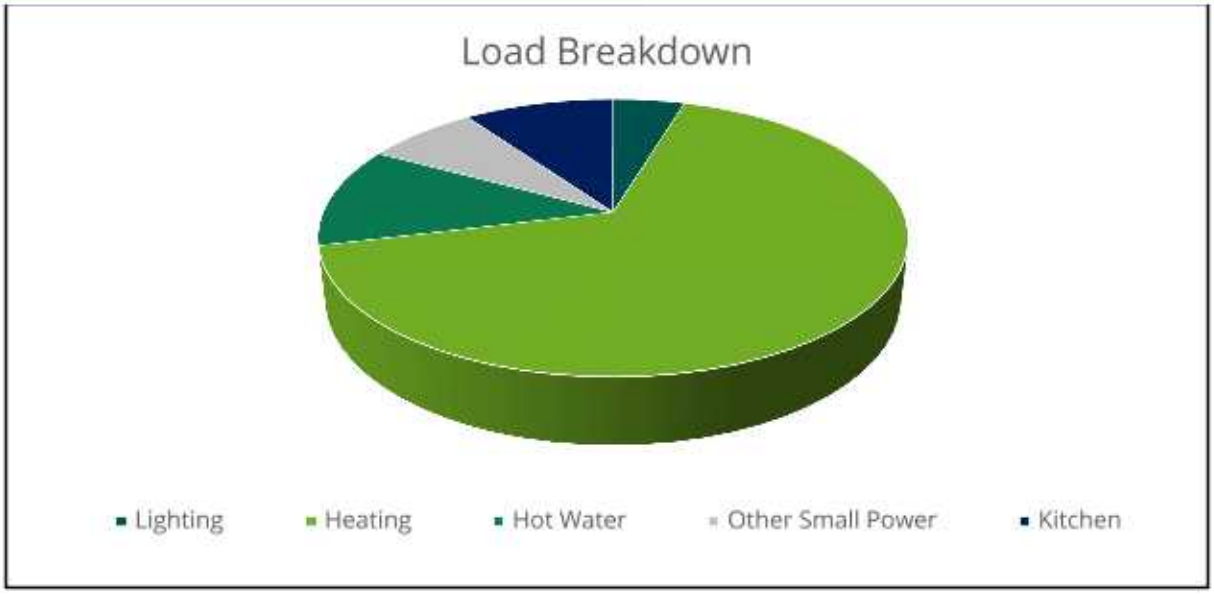
Utility	Meter Serial	Type	Pulsed output	Location
Electricity – House	K17D60551	3 phase 200A	Yes	Electrical intake room
Electricity – Stables	Not seen	Note seen	Note seen	No Access

All the meters are AMR connected and as such energy profile for the entire energy usage should be possible. Half hour meter data has been not provided for the purpose of this report and the church should contact their supplier to see if they can arrange to have access to this.

5.1 Energy Profiling

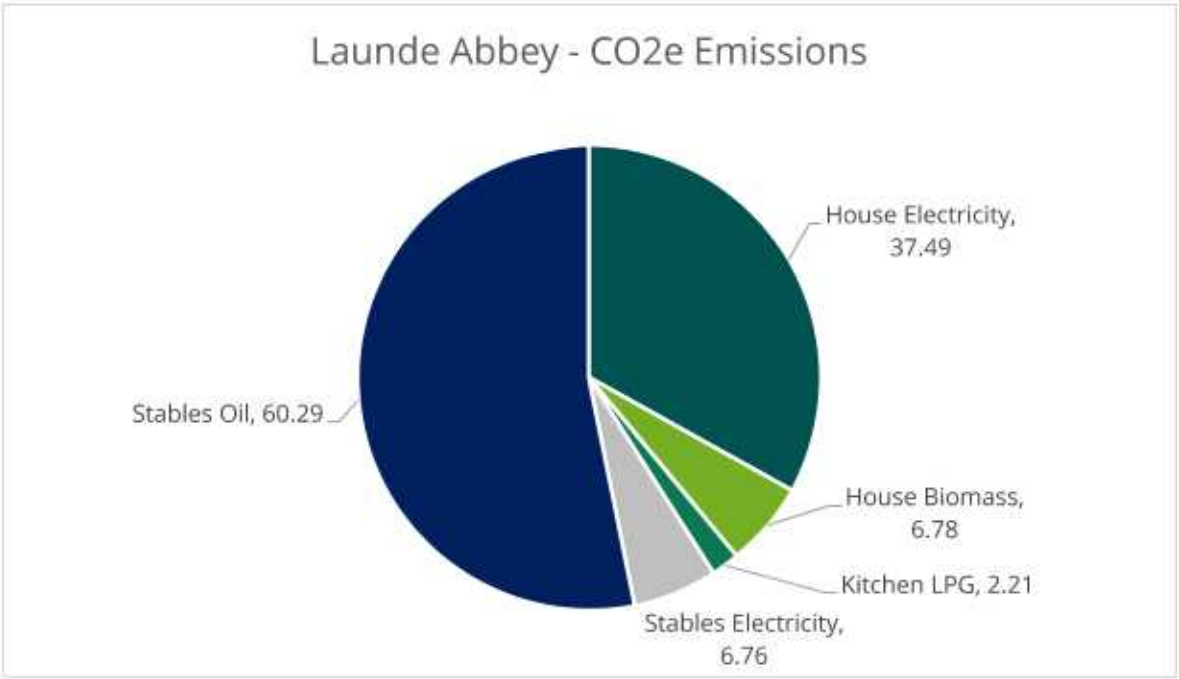
The main energy consuming plant can be summarised as follows:

Service	Description	Estimated Proportion of Usage
Lighting	Almost all LED lighting throughout – some minor areas (conference room) left to complete	5%
Heating	Biomass boiler to house and oil boiler to stable block providing heating through traditional radiator system	66%
Hot Water	Hot water provided by large hot water storage tanks located within the house basement plant area	12%
Other Small Power	Small appliances, IT, presentation equipment and the like	7%
Kitchen	LPG and electricity use within kitchen for cooking, refrigeration and washing up.	10%



As can been seen from this data, the heating makes up by far the largest proportion of the energy usage on site. This is also the largest carbon emitting area and the most challenging area to decarbonise.

A breakdown of the carbon emissions for the centre has also been calculated. This shows the oil heating to the stables is by far the largest source of carbon emissions with the electricity making up the next most significant proportion demonstrating the progress that can be made through procuring electricity from 100% renewable suppliers.



6. Efficient / Low Carbon Heating Strategy

The heating for this centre is quite different from that of a "standard" church. This centre has a constant need for heat as it is in occupation 24/7. Given the building is constantly heated, the conservation of heat within the building is very important therefore insulation measures should be prioritised.

In order to achieve zero carbon, we make recommendations about moving away from fossil fuels. Moves away from fossil fuels are key to cutting emissions. This will involve moving from gas, oil or LPG to electricity. Electricity currently creates carbon emissions around the same level as mains gas, but the carbon emissions associated with it are reducing rapidly as the UK builds more renewable energy and decommissions its remaining oil and coal fired power stations. Mains gas does have some potential to reduce its carbon content through the use of biogas and hydrogen but these are less developed solutions and will be unable to deliver 'zero carbon mains gas'. Some local areas may also be considering the option of district heating networks.

At present the centre has a biomass boiler arrangement for the house and an oil boiler for the stables. These boilers were installed in 2010 and 2009 respectively and therefore can still be expected to have a serviceable life for at least another 10 years. The biomass boiler also provides some RHI payments.

During the next 10 years efforts should be made to reduce the heating demand through insulation and the like (see advice later in this report) and also by moving the hot water provision away from the oil and biomass with the large stored hot water provision and towards electric heating of the hot water and the point of use with electric showers and under sink or similar electric water heaters. This move will make the future installation of a heat pump easier.

In 10 years time the centre should seriously explore the potential to install a ground source or water source heat pump into the extensive grounds or small lake. This should provide constant heating into both blocks and would allow for the heating to be fully decarbonised. There is an existing 200A 3 phase supply which should be sufficient to powering the heat pump.

The final step in decarbonisation would be to remove the reliance on LPG for the kitchen. In order to achieve this the kitchen would need to move to induction cooking and a gradual shift toward this when appliances need to be replaced should be considered.

6.1 Move to Electric Hot Water

The building is currently provided with hot water from a large hot water tank located in the basement. This is heated from the biomass boiler within the boiler room. As such the hot water is being heated by the biomass boilers for long period during the week when there is little demand for hot water which is limited to showering, handwashing, the kitchen sink and some of the cleaning.

A far more efficient method of generating hot water would be to remove the centralised large hot water storage tank and to have small, local electric point of use hot water heaters installed within each WC, shower and kitchen area. Units such as https://www.zipwater.co.uk/shop/hot-water/zip-inline-instantaneous-hot-water-heater-6kw-es6 heat the hot water only when the tap is turned on and does not have any stored hot water element. Electric shower solutions are commonplace. As such it is very energy efficient and it only ever heats the hot water that is required. It has additional advantages that it is 'always on' so does not require to have timings reset for ad hoc uses and as it does not have any stored water element it represents the lowest possible legionella risk profile. Installing electric hot water units will remove the need for the gas boiler and associated pumps to have to operate outside of the heating season and will assist in the transition to net zero carbon as the hot water is no longer served by burning of fossil fuels on site.

The installation of electric point of use hot water units and the removal of the biomass hot water system can be undertaken by any competent mechanical engineer.

6.2 Ground Source Heat Pump

The building is currently heated from a biomass/oil boiler which provides hot water into the heating system. The use of fossil fuels for heating means that it will not be possible to the building to become zero carbon without changing the heating system. A boiler also has heat and other efficiency losses within it which means that the efficiency of a boiler in converting the oil/biomass into the heat is typically around 80 to 95% (depending on the age and type of boiler). Ground source heat pumps use electricity to power the heat pump which takes heat from the constant temperature of the ground beneath the surface and puts this into water which can then go into the heating system. A heat pump can create around 4 units of heat for every one unit of electricity.

The existing boiler is approaching the end of its serviceable life and it is therefore recommended that the replacement of the existing boiler for a ground source heat pump is considered.

A new ground source heat pump is likely to require a heating capacity of around 200kW and could be installed in the area of ground of the estate parkland in front of the property or it could use a water source heat pump located in the small lake. As heat pumps operate on a low temperature basis some of the radiators and other heat emitters around the site may require upgrading. 3 phase electrical power may also be required to power the units. The installation will involve drilling large boreholes into the ground using heavy equipment so disturbance of the ground is involved.

There are currently government incentives available for installing ground source heat pumps but these are subject to future change and adaption so should be reviewed at the time of implementation.

6.3 Induction Cooking for Kitchen

The procurement of replacement and new equipment offers an opportunity to improve the energy efficiency and it is recommended that the following is considered at the time of replacement:

> Buy induction hobs or ranges and hot plates which only provide heat when a pan is placed on top of them. Such specifications are now becoming more common in top professional kitchens. (i.e. Dinner by Heston Blumenthal at the London's Mandarin Oriental and Glynn Purnell's Michelin-starred restaurant in Birmingham) (https://www.thecaterer.com/articles/343115/induction-10-years-on)

Procure dishwash units which recover and recycle the heat and avoid the need for extraction. https://www.winterhalter.com/uk-en/products/dishwashers/commercial-passthrough-dishwashers/

Review the annual energy consumption of all new units, including refrigeration units which remain on all the time. As an example, the Gram Superior Plus K72 uses around half the energy when compared to similar models from other manufacturers such as Foster over the course of a year https://www.eco-catering-equipment.co.uk/gram-superior-plus-k72-single-door-upright-refrigerator-cabinet-2-10c/

Locate ovens and chillers away from each other to avoid heating and cooling conflicts within the area.

Consider installing heat recovery on the supply and extract system so that the heat extracted from the kitchen is used to pre-heat the fresh air being supplied into the kitchen and dining area.

7. Energy Saving Recommendations

In addition to having a revised heating strategy there are also a number of other measures that can be taken to reduce the amount of energy used within the centre.

7.1 New LED Lighting

The vast majority of lighting in the centre is already LED and the centre should be commended for the efforts that they have put into achieving this 'quick win' energy saving measure.

The final element to complete is the lighting within the conference room. It is recommended that the fittings here are all changed for LED. There are a vast number of specifications of LED lights on the market but it is recommended that any LED light should come with branded chips and drivers and offer a 5 year warranty. An example of such a range of fittings is available from http://www.qvisled.com/ - their Proteus unit would be a very suitable style of fitting to replace the existing.

7.2 Refrigeration Controls

Within the centre there are various domestic and commercial refrigeration units such as fridges within the kitchen area. These units run 24/7 and contribute to the baseload electrical consumption of the building.

To reduce the electrical consumption of these appliances, it is recommended that they are all fitted with a SavaWatt unit. These units work by automatically detecting the load of the compressor and turning down the power when it is not in full load. This reduces the energy consumption of the refrigeration unit by around 18% while maintaining the cooling of the appliance. It does this by reducing the voltage delivered to the unit when it is idling but allowing the full energy to the unit when it is required.

Supply and installation and further details can be undertaken by SavaWatt directly http://savawatt.com/. (Note the self-installed SavaPlug has been discontinued, but the professionally installed Savacontrol option is available) The installation does not cause any significant disruption to operations and can be undertaken during normal operating times.

7.3 Insulation of Pipework and Fittings

The pipework within the plant room has the majority of its straight lengths insulated but the more complex shaped pipework fittings, such as flanges and valves, have been left uninsulated. These exposed areas of pipework contribute significantly to heat loss from the system and make the plant room unnecessarily warm. The exposed hot surfaces also represent a health and safety risk of burns for those working in the area.

It is recommended that these areas of exposed pipework and fittings are insulated with bespoke flexible insulation jackets. These wrap around the various elements but can be removed and then replaced for any servicing activities.

A free survey and quotation for the supply and installation of insulation of pipework fittings can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 930 9689, adrian@esos-energy.com).

7.4 Secondary Glazing

The windows of the conference room and coach house areas are singled glazed or poor quality double glazed with timber frames. These units could be changed to double glazed windows or, given that the windows to these areas are relatively small and have a simpler surround, and that they are not primary or important windows within the listed building, they would be suitable to have secondary glazing installed.

The introduction of secondary glazing would considerably reduce the heat loss through the existing windows and improve both thermal comfort and noise levels, as well as providing added security.

Any possible installation would need to be carefully specified, and companies such as https://www.selectaglaze.co.uk/heritage-listed-buildings or https://www.stormwindows.co.uk/ can provide very discrete and appropriate systems for all types of spaces.

7.5 Insulation to Roof

The loft void above the ceiling was inspected as part of this audit and found to have little insulation present and that which was there has been highly disturbed over the years and is no longer full effective. In all cases where there is 100mm or less of insulation within accessible roof spaces it is recommended that insulation be added to prevent heat loss and create a more comfortable environment for the occupants of the building.

Because heat rises, the ceiling/roof of a building is the largest contributing area to heat loss from a building. The insulation of such spaces can therefore have a dramatic impact on both the efficiency of the heating system and the temperature of the space below.

A free survey and quotation for the supply and installation of insulation to the loft spaces can be arranged through ESOS Energy Ltd (contact Adrian Newton 0117 9309689, adrian@esos-energy.com).

8. Other Recommendations

8.1 Electric Vehicle Charging Points

The centre has a car park to the side and front of it which serves the centre and also the frequently used cafe. In order to make a visible statement on the churches mission of stewardship and to facilitate more sustainable transport choices by those visiting the centre and/or using the cafe, the centre may wish to consider installing an electric vehicle charging point to allow visitors to charge their electric cars.

Installing a unit such as a Rolec Securi-Charge http://www.rolecserv.com/ev-charging/news/view/Robust-EV-Charging-With-Rolecs-SecuriCharge-EV-Wall-Unit-Coin-Token-PAYG would allow the organisation control over who is allowed to use the unit with a key operated system. Or given the type of use of the building and control over the usage of the car park as a whole a simple 32 amp type 2 wall pod type charger may be most suitable and these are widely available through many suppliers such as http://www.rolecserv.com/ev-charging/product/EV-Charging-Points-For-The-Home.

Because of the centre can be considered as a place of work and, as such, installation grants are available through the workplace charging scheme https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers which will fund 75% of the installation cost up to £300.

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	No – visible roof
Wind	May be possible in park land but unlikely to be easy to obtain permission
Battery Storage	No – no viable PV
Micro-Hydro	No – no water course
Solar Thermal	Unlikely
Biomass	Yes – currently used
Air Source Heat Pump	Yes
Ground Source Heat Pump	Yes

Given the centre listed status and the fine grounds in which is it set it is considered that the installation of panels (solar thermal or PV) on the roof is unlikely to be considered as being acceptable. While farm scale wind would also be a potential the park land style landscape would be impacted which planners are likely to be concerned about.

Heat Pumps are a low carbon method of creating heat, there strong suitability for this centre have been review in the section earlier on in this report on Efficient and Low Carbon Heating Strategies.

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-Jan-2019.pdf .

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.

Works which affect the external appearance of the centre 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. Offsetting

As you take action to reduce your emissions, you may also wish to offset those that you cannot yet reduce. If you would like to engage in offsetting, it is important to use a reputable scheme. The Church of England recommends Climate Stewards, which has a simple calculator that can help you to work out how much you would need to offset. https://www.climatestewards.org/

Climate Stewards encourages people to 'reduce what you can and offset the rest' as part of your journey to Net Zero carbon emissions. They provide training and resources to help you understand climate change and its impacts, and to calculate the carbon footprint from your activities including travel, energy, expenditure, and food. Their online carbon calculators for individuals and smaller organisations are free to use, and they provide bespoke carbon footprint audits for larger organisations.

Having reduced as much of your organisation's carbon footprint as you can, there will always be unavoidable emissions from your work and travel. Carbon offsetting allows you to compensate for the negative impact of your carbon emissions by funding projects which take an equivalent amount of CO_2 out of the atmosphere. These either involve locking up ('sequestrating') CO_2 as trees grow, or reducing emissions by using low-carbon technology such as fuel-efficient cookstoves or water filters.

Climate Stewards has a close relationship with all their project partners in Ghana, Uganda, Kenya, Tanzania, Nepal and Peru. They work closely with them to design, develop, implement and monitor projects which will not only mitigate carbon, but also bring tangible benefits to the local community - including improved health, savings in time and money previously spent on buying or collecting fuel, and improvements in local biodiversity. Each project is assessed using their Seal of Approval protocol which enables us to assess and monitor carbon mitigation and ensure robust, sustainable and transparent partnerships.