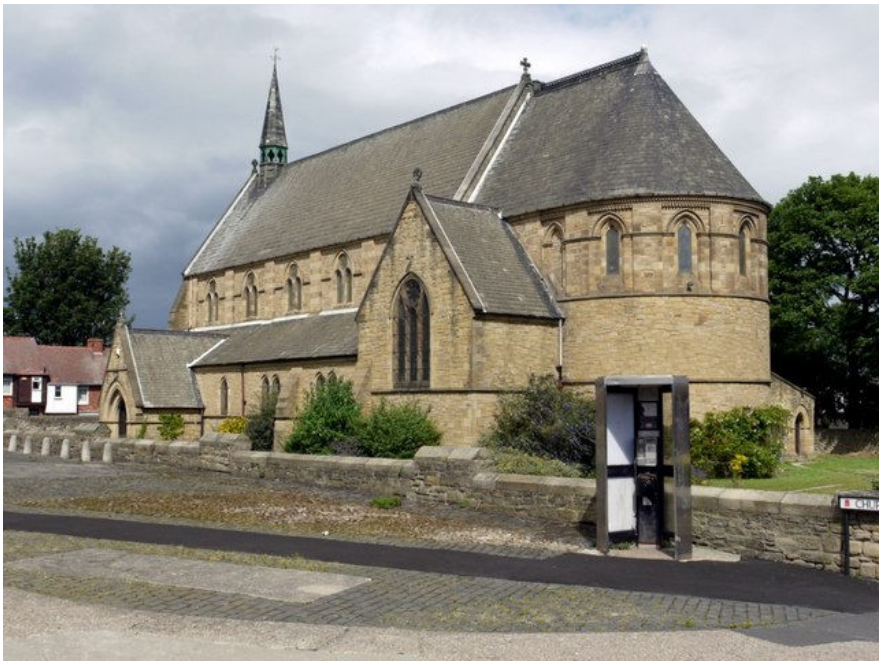
Energy Audit Report for Christ Church Felling



Site Address	Christ Church Felling, Carlisle Street, Felling, Gateshead, NE10 0HQ
Church Code	613062
Author	Tim Mawby Graduate Consultant
Date	25th March 2020
Version	1.0

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1 Executive Summary

An energy survey of Christ Church Felling, Carlisle Street, Felling, Gateshead, NE10 0HQ was undertaken by ESOS Energy 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. This audit has been provided in conjunction with 2buy2, the Church of England's Parish Buying scheme provider.

This energy audit has been undertaken by a suitably qualified and experienced energy auditor. Benefits of implementing the opportunities identified in this Report include a reduction in energy costs in the first instance, but could also reduce other costs, increase staff awareness and engagement, and improve comfort and staff satisfaction in the workplace.

The Church has a number of ways in which is 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 is used as the action plan for the church in implementing these recommendations over the coming years:

Energy Saving Measure	Annual Energy Savings (kWh)	Annual Cost Savings (£)	Estimated Capital Cost	Payback Period (Years)	Annual Carbon Savings (Tonnes CO_2e)
Add insulating lagging to exposed heating pipework	826	£48	£100	2.1	0.2
Add 7-day timers to boilers and gas storage heaters	23,589	£1,368	£300	0.2	4.9
Church – replace halogen floodlights with LED alternatives	218	£34	£140	4.1	0.1
Church – fluorescent tubes with LED alternatives	60	£9	£80	8.9	<0.1
Vestry – replace fluorescent tubes with LED alternatives	15	£2	£20	10.0	<0.1
Meeting Room – replace fluorescent lamps with LED alternatives	7	£1	£10	10.0	<0.1
Creche – replace fluorescent tubes with LED alternatives	15	£2	£20	10.0	<0.1
Kitchen – replace CFL with a LED alternative	6	£1	£10	10.0	<0.1
WCs – replace CFLs with LED alternatives	18	£3	£30	10.0	<0.1
GRAND TOTAL	**24,754**	**£1,469**	**£710**	**0.5**	**5.2**

The headline messages from the audit are:

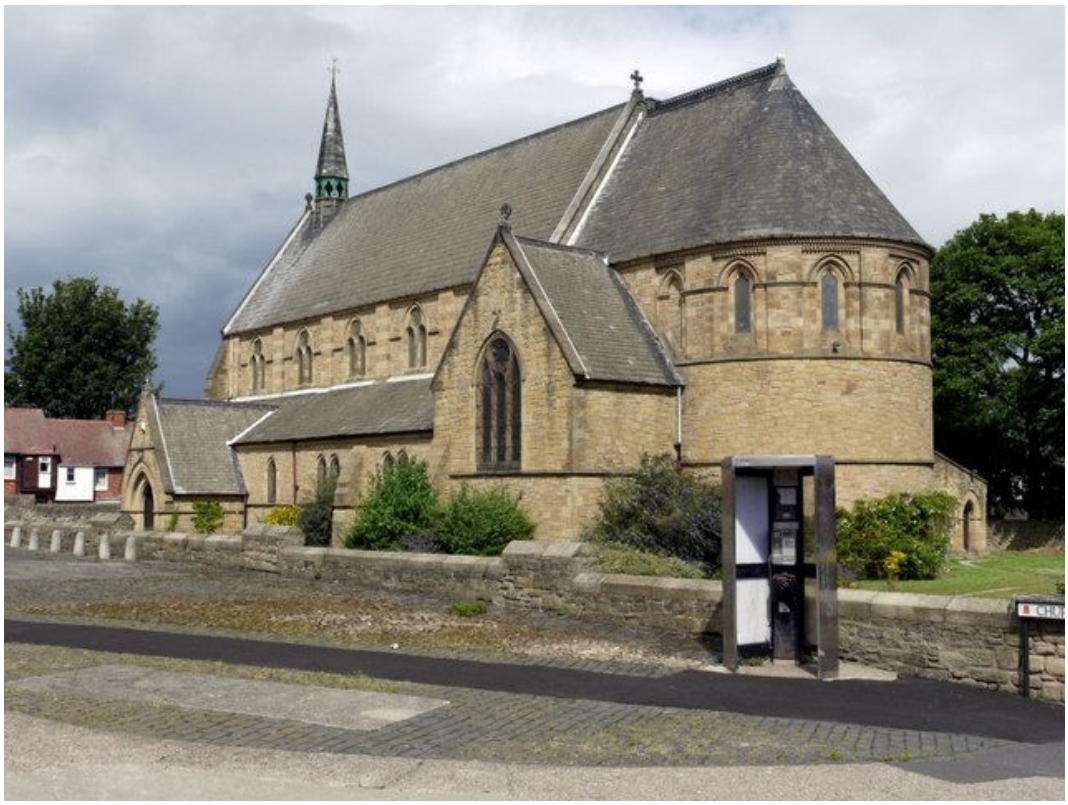
- £710 investment in energy reduction measures would achieve an estimated annual saving of 24,754kWh (combined electric and gas).
- Based on current electricity and gas tariffs, this would result in an annual financial saving of £1,469.
- The simple payback period on this investment is 0.5 years.

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

2 Church Information

A site survey was undertaken by Tim Mawby on Tuesday 24th March 2020. The survey was non-invasive (visual only) and entailed a general walk throughout the church areas, including back of house spaces and plant rooms.

Photograph 1: Christ Church Felling External View



General Information	
Site Address	Christ Church Felling Carlisle Street Felling Gateshead NE10 0HQ
Listed Status	Grade II Listed
Building Age	Built in 1240
Floor Area	Approximately 650m^2
Usage	Typically 4 hours per week

3 Energy Procurement Review

Energy bills for gas and electricity have been supplied and have been reviewed against the current market rates for energy.

3.1 Electricity

Day Rate	15.78 p/kWh

3.2 Gas

Rate	5.80 p/kWh

The review has highlighted that there may be opportunities to gain environmental benefits from improved procurement of the energy supplies at this site.

We would therefore recommend that the Church obtains a quotation for its gas and electricity supplies from the CofE Parish Buying scheme (https://www.parishbuying.org.uk/categories/energy/energy-basket). This scheme only offers renewably sourced energy and therefore it is an important part of the process of making Churches more sustainable.

4 Energy Usage Details

4.1 Cost & Consumption

Energy Type	Annual kWh
Gas	32,107
Electricity	2,264

If not already in place, it is recommended that the Church consider asking their suppliers to install smart meters so that the usage can be monitored more closely, and the patterns of usage reviewed against the times the building is in use.

4.2 Energy Benchmarking (Based on CofE Shrinking the Footprint – Energy)

Energy Type	Size (Sqm)	Benchmark Energy Use (kWh/Sqm)	Actual Energy Use (kWh/Sqm)	Variance from Benchmark (%)
Gas	650	105	50	-50%
Electricity	650	20	3	-85%

The Church is using less Gas & Electricity than expected.

5 Building Performance and Opportunities

The building is well run with a proactive onsite team in terms of energy conversation with some areas of improvement already being identified. The following sections will highlight where further improvements could potentially be made.

5.1 Building Envelope

From visual inspection, the building envelope appears to be in a reasonably good state of repair. The building has no wall or roof insulation.

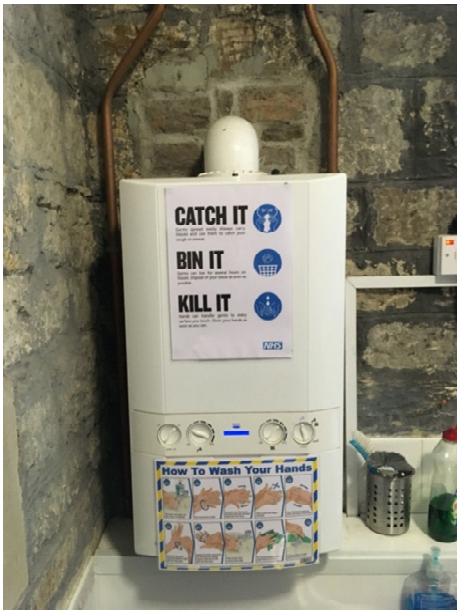
5.2 Heating System – Boilers

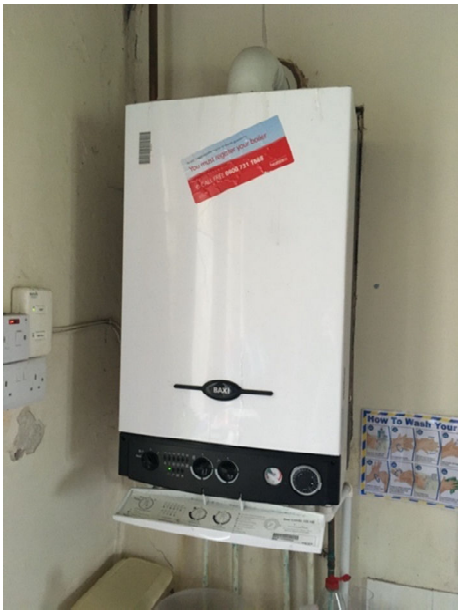
Heating is provided to the main body of the church via 4no. gas storage heaters. 2no. gas combination boilers supply heat to other areas. A Logic Combi 24 gas combination boiler (photograph 2) is located in the kitchen and provides space heating to the kitchen, creche and WC areas. A Baxi Combi 105HE gas combination boiler (photograph 3) is located in the vestry and supplies space heating to the vestry and meeting room. The boilers on-site are 7-10 years old and are in good condition and well maintained.

These boilers are operated via the boilers' timers. Both timers are programmed to operate for 2 hours every morning and 1 hour in the evening, despite the building not being occupied. However, the temperature is set relatively low and guards against frost in the colder months.

While the boilers appear to be in good order and are not at the end of their expected lifetimes; the client may wish to explore the possibility of installing an air source heat pump heating system in order to move towards the goal of decarbonising energy consumption.

Photographs 2 & 3: Church Boilers





5.3 Heating System – Pipework and Distribution

Both heating systems' pipework is entirely exposed. As such, it is recommended that insulating lagging is fitted to the existing pipework to reduce heat loss is unoccupied spaces.

5.4 Heating System – Heat Emitters

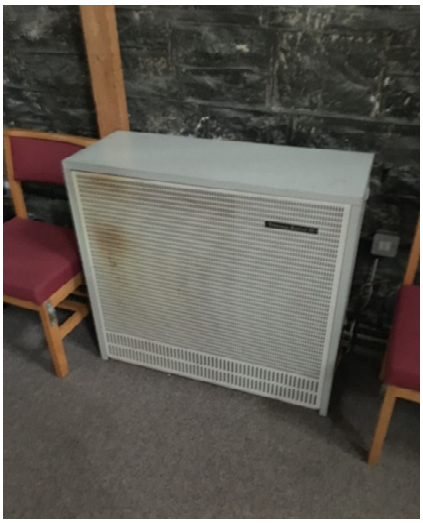
The church is not connected to the central heating boilers. Heating to the main body of the church is served via 4no. Temcana Kestrel 55 wall-mounted gas storage heaters (photograph 4). These heaters are supplied by gas inlet pipes fixed to the walls. The timers are set to 9am-12:30pm every day despite the church not being open 6 days a week.

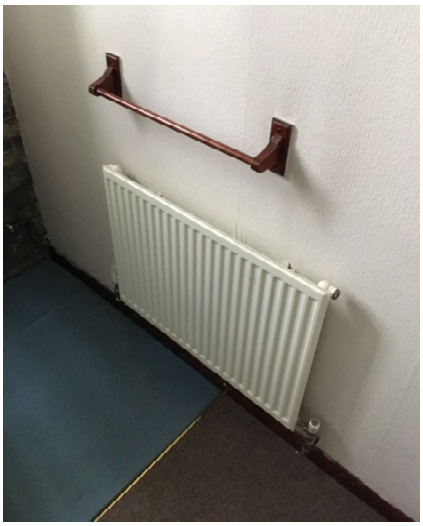
There are also 3no. older decommissioned gas storage heaters situated in the main body of the church.

There are also 7no. iron radiators (photograph 5) located in the smaller rooms of the church, with 2no. in WCs, 2no. in the creche, 2no. in the vestry and 1no. in the meeting room.

A range of portable plug-in heaters are also present throughout the building and are used to provide additional heating to the smaller rooms when required. This can be an ineffective, inefficient and poorly controlled means of providing space heating, and can easily be left on when unoccupied. It is recommended that a more permanent heating solution be provided to these spaces if and when heating upgrades are undertaken.

Photographs 4 & 5: Church Heat Emitters

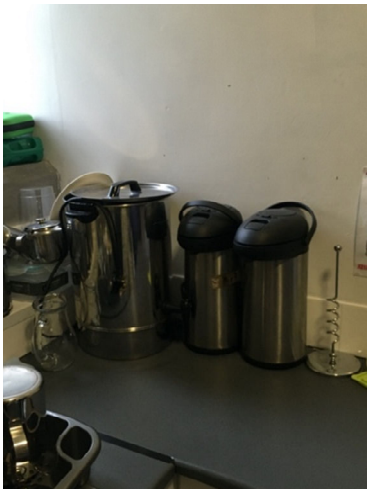




5.5 Hot Water System

Hot water is supplied to the building via the 2no. gas combination boilers. The Logic Combi 24 supplies kitchen and WC areas. The Baxi Combi 105HE supplies a single sink in the vestry. Electric point of use water heaters are also present in the kitchen. Hot water usage is considered to be nominal.

Photograph 6: Electric Water Heater



5.6 Lighting

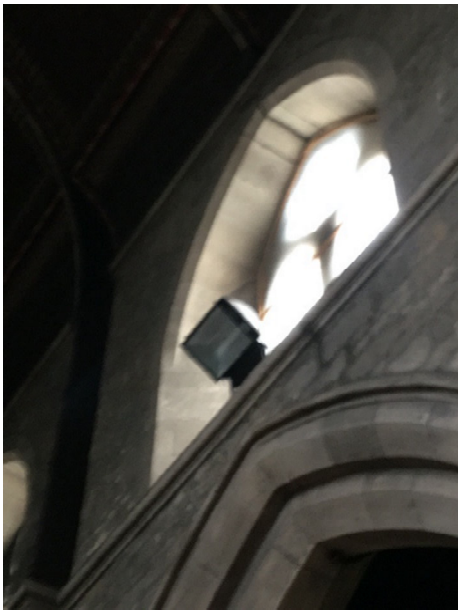
There is no lighting control system, motion detectors or daylight dimming controls. All light fittings are controlled via manual on/off switches.

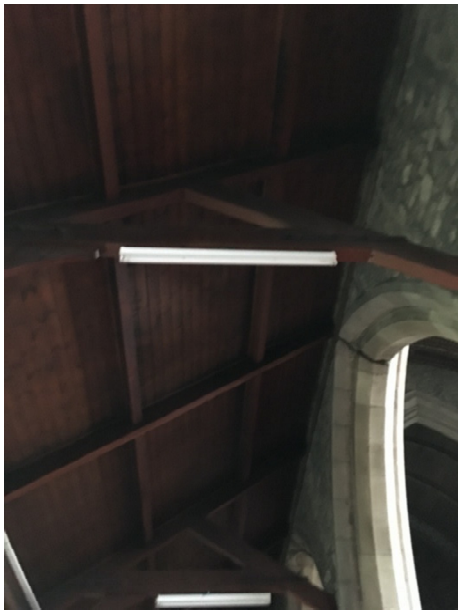
The range of light fittings throughout the church areas are detailed below:

Church

- 7no. 200W halogen floodlights – recommended to be replaced with 50W LED alternatives.
- 8no. 58W T8 fluorescent tubes – recommended to be replaced with 22W LED alternatives

Photographs 7 & 8: Church Light Fittings

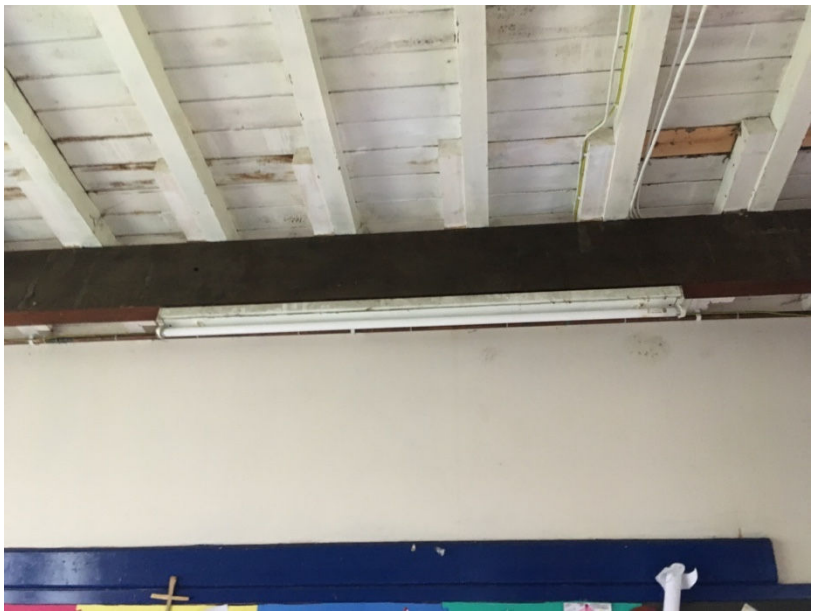




Vestry

- 2no. 58W T8 fluorescent tubes – recommended to be replace with 22W LED alternatives.

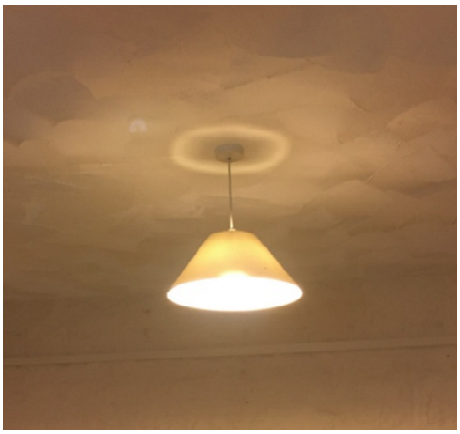
Photograph 9: Fluorescent Tubes



Meeting Room

- 2no. 20W pendant fluorescent lamps – recommended to be replace with 3.5W LED alternatives.

Photograph 10: Pendant Fluorescent Lamps



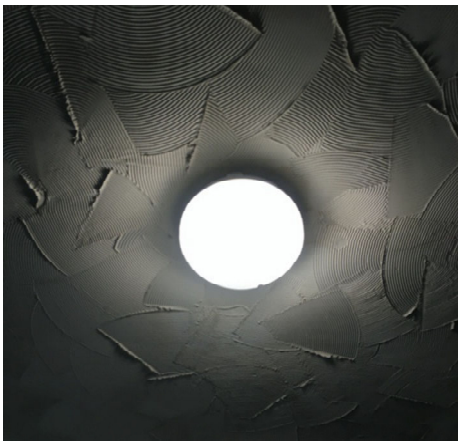
Creche

- 2no. 58W T8 fluorescent tubes – recommended to be replace with 22W LED alternatives.

Kitchen

- 1no. 36W compact fluorescent lamp – recommended to be replace with a 7.5W LED alternative.

Photograph 11: Compact Fluorescent Lights



WCs

- 3no. 36W compact fluorescent lamps – recommended to be replaced with 7.5W LED alternatives.

5.7 Renewables

There are currently no renewables on-site. A free desktop survey can be carried out by a specialist solar installer to identify the possibility of installing solar PV panels.

6 Potential Saving Opportunities

As part of the assessment, we carry out a close inspection of M&E plant and their associated controls, with the aim of identifying any issues that have significant impact on energy consumption and correct building operation. We have reviewed the building and associated HVAC and lighting operations and identified the following potential energy conservation opportunities (ECOs), which should be investigated:

Category	Actions	Potential Annual Savings			Investment (£)	Simple payback (yrs.)
		Elec/Gas (kWh)	Cost (£)	(tCO_2)		
Heating	Add insulating lagging to exposed heating pipework (estimated 3% saving)	826	£48	0.2	£100	2.1
Heating	Add 7-day timers to 2no. boilers and 4no. gas storage heaters. (estimated 86% saving)	23,589	£1,368	4.9	£300	0.2
Lighting	Church – replace 200W halogen floodlights with 50W LED alternatives	218	£34	0.1	£140	4.1
Lighting	Church – 58W fluorescent tubes with 22W LED alternatives	60	£9	<0.1	£80	8.9
Lighting	Vestry – replace 58W fluorescent tubes with 22W LED alternatives	15	£2	<0.1	£20	10.0
Lighting	Meeting Room – replace 20W pendant fluorescent lamps with 3.5W LED alternatives	7	£1	<0.1	£10	10.0
Lighting	Creche – replace 58W fluorescent tubes with 22W LED alternatives	15	£2	<0.1	£20	10.0
Lighting	Kitchen – replace 36W CFL with a 7.5W LED alternative	6	£1	<0.1	£10	10.0
Lighting	WCs – replace 36W CFLs with 7.5W LED alternatives	18	£3	<0.1	£30	10.0
TOTAL ELECTRICITY SAVINGS		**339**	**£53**	**0.1**	**£310**	**5.8**
TOTAL GAS SAVINGS		**24,415**	**£1,416**	**5.1**	**£400**	**0.3**
GRAND TOTAL		**24,754**	**£1,469**	**5.2**	**£710**	**0.5**

7 Assumptions

7.1 Assumptions

- Costs exclude labour, installation and access which will require the confirmation of a specialist contractor.
- Average cost of electricity at 15.78p/kWh.
- Average cost of gas at 5.80p/kWh.

- Electricity carbon emission rate of 0.31598 kgCO_2/kWh.
- Natural Gas carbon emission rate of 0.20776 kgCO_2/kWh.

7.2 Economic Life

CIBSE Guide M Appendix 12.A1 gives the economic life of plant common plant items. After this time the maintenance and repair make it economic to replace the asset. There will be energy savings inherent in the new equipment and the need to meet the minimum requirements of the Building Regulations. Some capital plant has long payback periods, when based on energy efficiency alone, but these should be part of an asset replacement programme with only the 'additional' cost of higher than minimum required energy standards being used to calculate ROI.

7.3 Implementation

Reviews of Energy Projects and Initiatives are designed to provide a high-level indication of options available clients and will not constitute a recommendation for implementation. Pricing and potential savings are indicative values and will not constitute an offer.

7.4 Cumulative Savings and Double Counting

It should be noted that further investigation may rule out some measures as impractical, either physically or financially. Some measures are mutually exclusive and provide diminishing returns if implemented together. For example, if the lighting load is reduced through more efficient lighting, there will be an increase in the heat demand on boilers, as the new lights generate less heat.

Each energy conservation measure is assessed independently at this stage so that they can be fairly compared. An assessment of any overlap will be undertaken once any projects are selected for implementation.

8 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-Nov-2019.pdf

9 Faculty Requirements

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

Minor works 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.

Major 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,

10 Limitations

The recommendations contained in this Report represent ESOS Energy's professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Sustainability Consultant.

ESOS Energy obtained, reviewed and evaluated information in preparing this Report from the Client and others. ESOS Energy conclusions, opinions and recommendations has been determined using this information. ESOS

Energy does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which ESOS Energy has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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