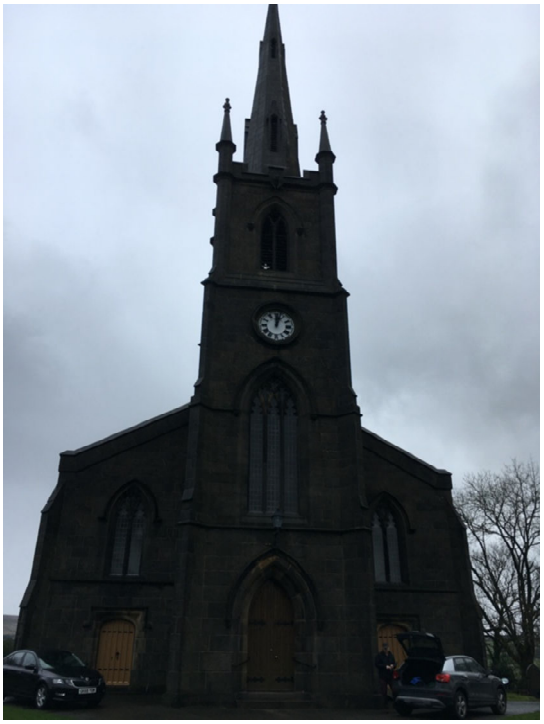
ESOS-ENERGY
Energy efficient solutions

Energy Audit Report for St. Anne's Church



Site Address	St. Anne's Church, Turton, BL7 0EH
Church Code	624387
Author	Tim Mawby Graduate Consultant
Date	21st January 2020
Version	1.0

Contents

1 Executive Summary

An energy survey of St. Anne's Church, Turton, BL7 0EH 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)
Replace the existing boiler with a new condensing gas boiler.	44,602	£1,548	£12,000	7.7	9.3
Church – replace pendant halogen lamps with LED alternatives.	1,385	£139	£180	1.3	0.4
Church - replace fluorescent pendant lamps with LEDs.	874	£87	£225	2.6	0.3
Church - replace halogen spotlights with LED alternatives.	1,616	£162	£210	1.3	0.5
Broadhead Room – replace fluorescent panels with LEDs.	247	£25	£90	3.6	0.1
Choir Vestry – replace recessed fluorescent panels with LEDs.	55	£5	£20	4.0	<0.1
Vicar's Vestry – replace pendant halogen with a LED alternative.	77	£8	£10	1.3	<0.1
Kitchen – replace fluorescent tubes with LED alternatives.	60	£6	£20	3.3	<0.1
TOTAL SAVINGS	**48,916**	**£1,979**	**£12,755**	**6.4**	**10.7**

The headline messages from the audit are:

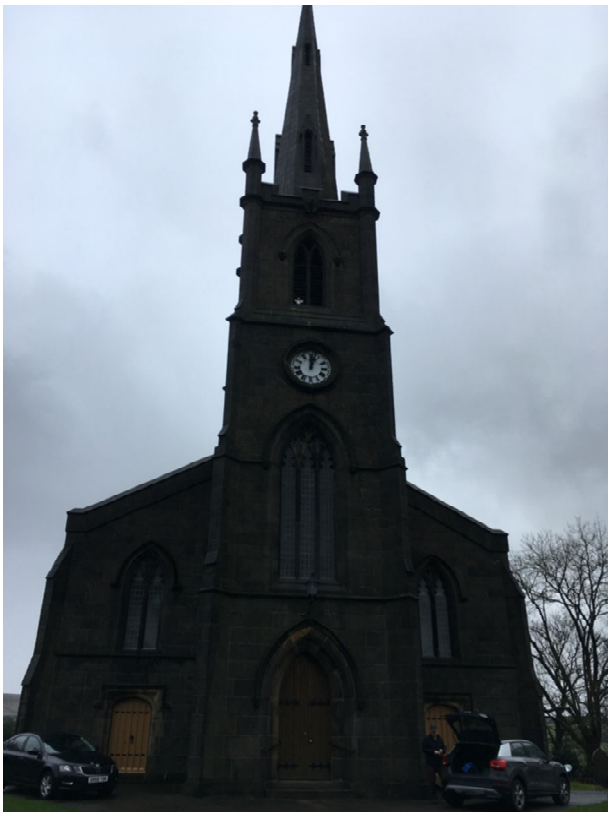
- £12,755 investment in energy reduction measures would achieve an estimated annual saving of 48,916kWh (combined electric and gas).
- Based on current electricity and gas tariffs, this would result in an annual financial saving of £1,979.
- The simple payback period on this investment is 6.4 years.

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 Friday 17th January 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: St. Anne's Church External View



General Information	
Site Address	St. Anne's Church Turton BL7 0EH
Listed Status	Grade II listed
Building Age	Built in 1841
Floor Area	Approximately 600m^2
Usage	Typically 16 hours per week

3 Energy Procurement Review

Energy bills for gas have been supplied and have been reviewed against the current market rates for energy, however energy bills for electricity have not been supplied. Current market rates for energy have been used to estimate electricity consumption.

3.1 Electricity

Day Rate	10.00 p/kWh

3.2 Gas

Rate	3.47 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	172,873
Electricity	20,150

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	600	105	288	275%
Electricity	600	20	33	65%

The Church is using much more Gas than expected. The Church is using more Electricity than expected.

5 Building Performance and Opportunities

The building is well run with proactive on-site 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

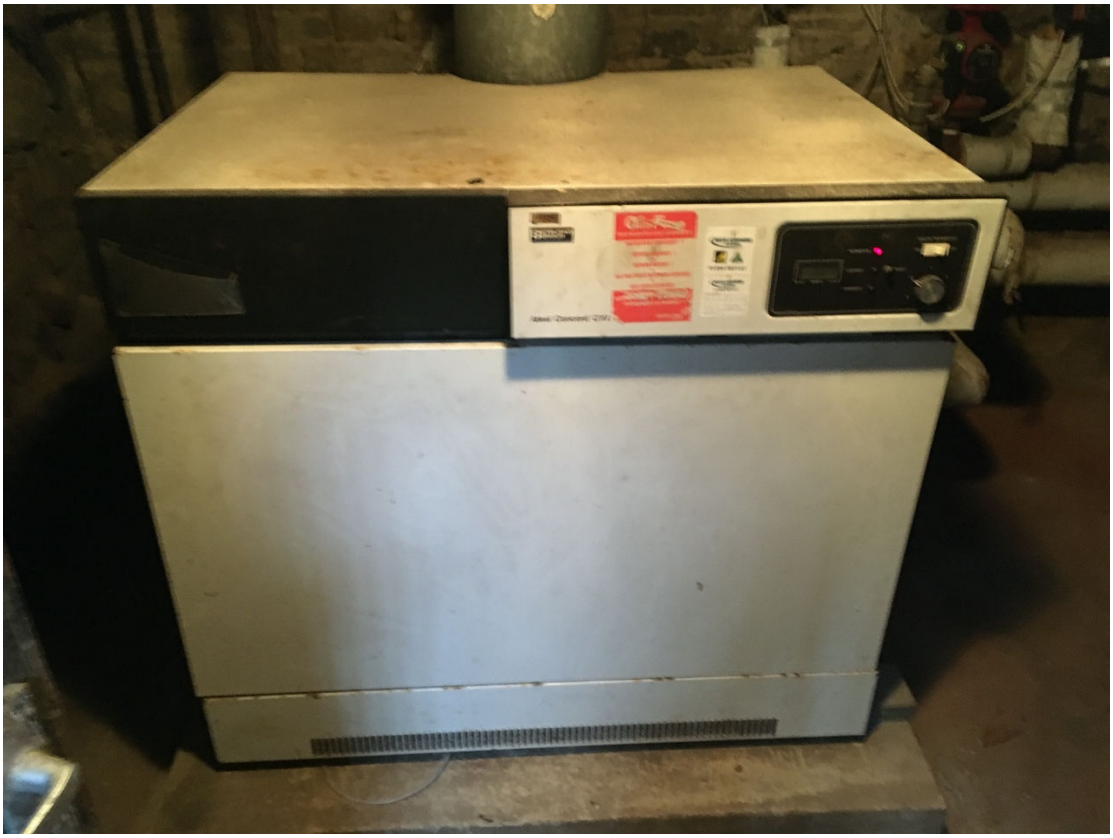
From visual inspection, the building envelope appears to be in a reasonable state of repair. Wall and roof insulation are not present.

5.2 Heating System – Boilers

Heating is provided to the church by an Ideal Concord CXi gas fired boiler (installed approximately 30 years ago) located in the basement plant room. The boiler is operated using a timer, which has 2no. program schedules; one for the summer months (11 hours per week) and another for the winter months (39 hours per week). The controls in the Vicar's Vestry also allow for a manual override, so that heating can be provided outside of the scheduled hours. Based on the age of the boiler, it is assumed that the efficiency of the boiler may have dropped to as little as 60%. As such, it is recommended that the boiler is replaced with a high efficiency gas condensing boiler.

It is recommended that the existing gas boiler be replaced with a modern alternative. Additionally, the client may consider exploring the possibility of installing an air to water heat pump heating system in order to move towards the goal of decarbonising energy consumption.

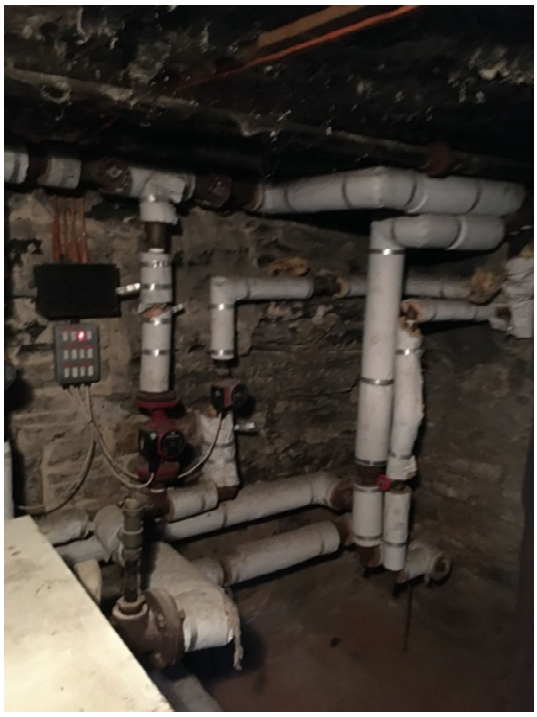
Photograph 2: Church Boiler



5.3 Heating System – Pipework and Distribution

The heating system pipework is in good repair, with well-maintained insulating lagging in good condition. As such, no recommendations have been made in this area.

Photograph 3: Heating System Pipework

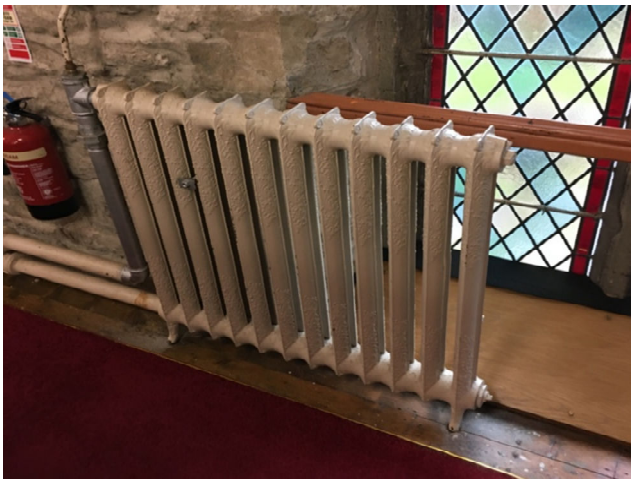


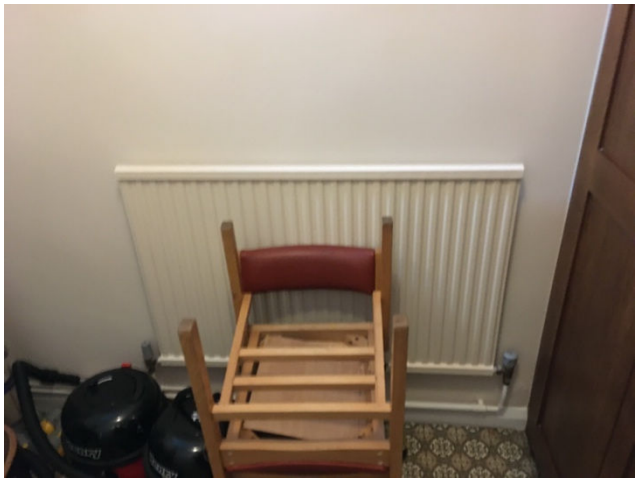
5.4 Heating System – Heat Emitters

Heating to the church is provided via 8no. cast-iron radiators supplied by heating pipes in floor trenches as well as by heating pipes fixed to the walls. Heating to the Broadhead Room is provided by 4no. wall-mounted radiators. The radiators in the Broadhead Room are switched on for 1-hour at a time. There are also 2no. radiators in WC areas, and 1no. radiator in both the choir vestry and Vicar's vestry. Radiators are typically obstructed by furniture which limits the effectiveness of the heating. It is advised that items are removed from the immediate vicinity to allow for better heat convection in the space.

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: Heat Emitters

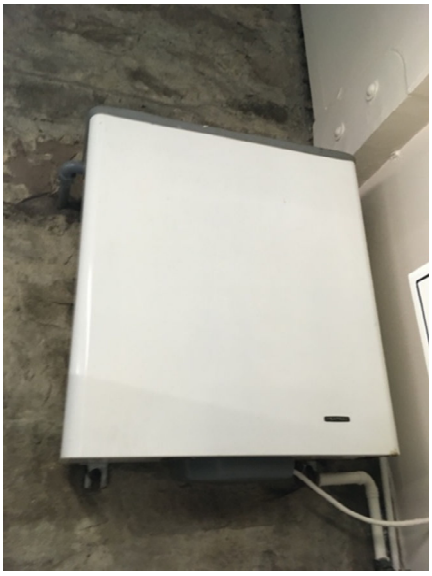




5.5 Hot Water System

Hot water is provided to the WCs via an electric Heatrae water heater. A Lincat electric point of use water heater provides hot water to the kitchen. Hot water consumption is considered to be minimal.

Photograph 5: Electric Water Heater



5.6 Lighting

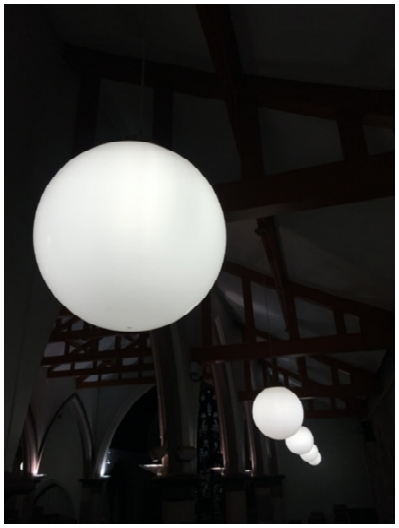
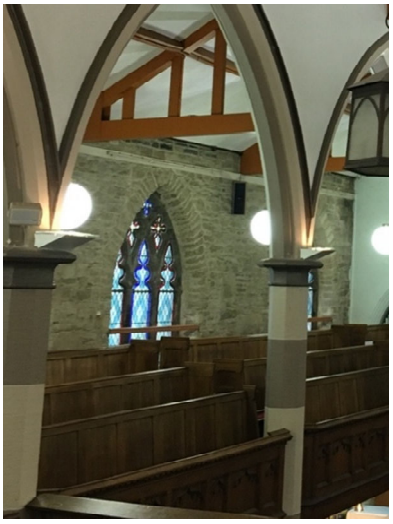
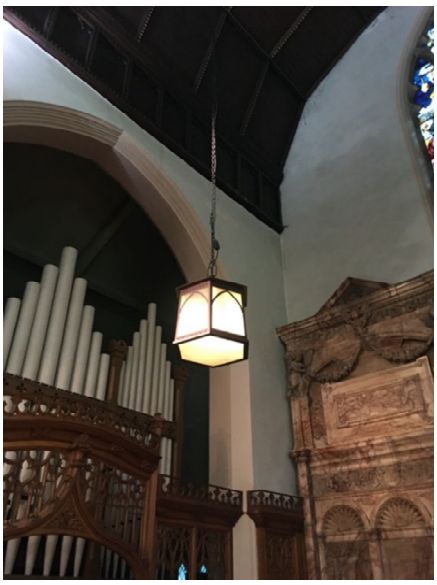
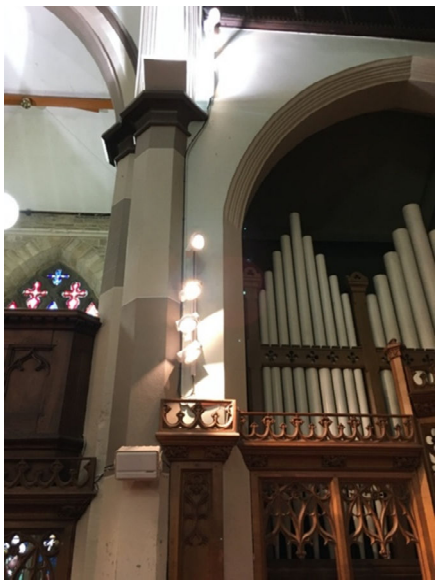
There is no lighting control system, motion detectors or daylight dimming controls. All light fittings are controlled via manual on/off switches.

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

Church

- 18no. 100W pendant halogen lamps – recommended to be replaced with 7.5W LED alternatives.
- 10no. LED uplights.
- 3no. 500W fluorescent pendant lamps – recommended to be replaced with 150W LED alternatives.
- 21no. 100W halogen spotlights – recommended to be replaced with 7.5W LED alternatives.

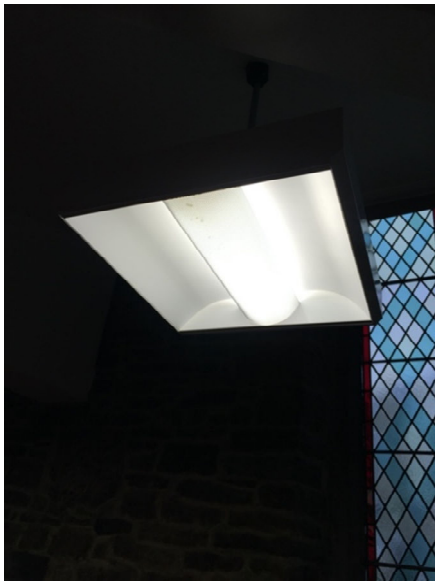
Photographs 6, 7, 8 & 9: Church Lighting

Broadhead Room

- 9no. 55W recessed fluorescent panels – recommended to be replaced with 22W LED alternatives.

Photograph 10: Recessed Panels



Choir Vestry

- 2no. 55W recessed fluorescent panels – recommended to be replaced with 22W LED alternatives.

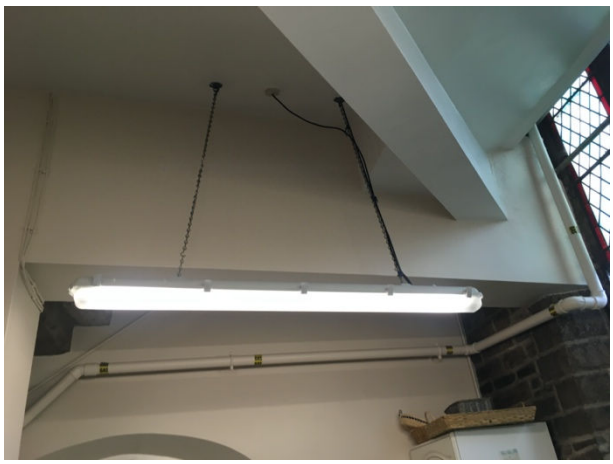
Vicar's Vestry

- 1no. 100W pendant halogen lamp – recommended to be replaced with a 7.5W LED alternative.

Kitchen

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

Photograph 11: Fluorescent Tubes



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	Replace the existing boiler with a new condensing gas boiler (Increase 60% to 90% efficiency)	44,602	£1,548	9.3	£12,000	7.7
Lighting	Church – replace 100W pendant halogen lamps with 7.5W LED alternatives.	1,385	£139	0.4	£180	1.3
Lighting	Church - replace 500W fluorescent pendant lamps with 150W LED alternatives.	874	£87	0.3	£225	2.6
Lighting	Church - replace 100W halogen spotlights with 7.5W LED alternatives.	1,616	£162	0.5	£210	1.3
Lighting	Broadhead Room – replace 55W recessed fluorescent panels with 22W LED alternatives.	247	£25	0.1	£90	3.6
Lighting	Choir Vestry – replace 55W recessed fluorescent panels with 22W LED alternatives.	55	£5	<0.1	£20	4.0
Lighting	Vicar's Vestry – replace 100W pendant halogen with a 7.5W LED alternative.	77	£8	<0.1	£10	1.3
Lighting	Kitchen – replace 58W fluorescent tubes with 22W LED alternatives.	60	£6	<0.1	£20	3.3
TOTAL ELECTRICITY SAVINGS		**4,314**	**£431**	**1.4**	**£755**	**1.8**
TOTAL GAS SAVINGS		**44,602**	**£1,548**	**9.3**	**£1,100**	**0.7**
GRAND TOTAL		**48,916**	**£1,979**	**10.7**	**£12,755**	**6.4**

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 10.00p/kWh.
- Average cost of gas at 3.47p/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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