

Outline strategy for reaching ‘net-zero’ emissions of greenhouse gases by 2035

1. Background

Burning fossil fuels releases the greenhouse gases that increase global temperatures. Around the world we are already seeing many impacts of our changing climate system – risk to water supplies, conflict and climate migrants, localised flooding, flooding of coastal regions, damage to marine ecosystems, fisheries failing, loss of biodiversity, change in seasonality, heat stress, habitable region of pests expanding, forest mortality and increase risk of fires, damage to infrastructure, food insecurity... the list goes on.

People are rightly concerned, with the latest report from the UN’s Intergovernmental Panel on Climate Change (IPCC) showing that if we fail to limit global warming to 1.5°C above pre-industrial levels, these impacts will become more severe and more frequent. Above 1.5°C we risk reaching climatic ‘tipping points’ like the melting of arctic permafrost – releasing millennia of stored greenhouse gases – and the Greenland and Antarctic ice sheets, meaning that we could lose control of our climate for good. But the good news is that there is, still, a path to avoid catastrophic climate change. The science could not be clearer: by the middle of this century the world has to reduce emissions to as close to zero as possible, with the small amount of remaining emissions absorbed through natural carbon sinks like forests, and new technologies like carbon capture. If we can achieve this, global emissions of greenhouse gases will be ‘net zero’. [Note the IPCC’s definition (simplified): “Net-zero emissions are achieved when anthropogenic (i.e. man-made) emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period.”]

Delivering this requires urgent and concerted global action, including ending coal-fired power generation, retiring petrol and diesel engines from all cars, halting deforestation etc. Most of the world’s major emitting nations – along with large numbers of major cities, companies and organisations have set targets to reach net zero emissions by 2050 (or in one or two cases 2060), some sooner.

Recognising that the global climate emergency is a crisis for God’s creation and a fundamental injustice, in February 2020 the General Synod voted to set a target of achieving net-zero emissions in its building and transport by 2030. The Synod asked for a plan to be made, setting out how to get to net-zero emissions. That plan of action, called the ‘Routemap’ (https://www.churchofengland.org/sites/default/files/2022-06/nzc_2030_routemap_june22.pdf), was approved by General Synod in July 2022 in a Motion that asked for the Routemap to be endorsed, requested every Diocesan Synod to debate the Routemap as it applies to them, requested high-energy users within the

Church to draw up a programme of action based on the Routemap, and called for progress reports to Synod every three years.

As a result, the Diocese of Oxford adopted a wider diocesan goal of reaching net zero in full by 2035.

Recommendation #1: *Pass a motion at PCC to recognise the climate emergency and the General Synod and Diocese of Oxford targets. Make a commitment as a church.*

2. General approach

The following four-step approach is suggested in the CofE Routemap:

- A. Plan** – review building/estate, identify what needs to be done and when. Use this to plan suitable times for work, identify if projects can be aggregated for cost-saving or to obtain funding and to optimise funds, skills and resources.
- B. Maintain** – keep on top of routine maintenance to reduce energy consumption and hence carbon emissions.
- C. Reduce** – consider where and why using energy and whether there are ways to reduce energy consumption and travel to eliminate carbon emissions. This includes changes in behaviour and ways of working as well as changes to heating and lighting systems and the use of different means of travel.
- D. Opportunities** – look for actions that reduce carbon emissions and also generate income (e.g. solar PV panels, electric vehicle charging points) and interventions that can deliver multiple benefits (e.g. reduced air pollution, community use, prevention of overheating in a warming climate).
 - Easy wins – Consider the easy wins to reduce emissions in all buildings:
 - Establishing working groups, developing understanding of issues, sharing experience, identifying and implementing policy changes.
 - Gathering data to enable demonstration of benefits and reductions.
 - Encouraging behaviour change – switching off unneeded lighting and equipment, choosing low-carbon travel options or avoiding travel.
 - Switching to green electricity and gas tariffs at point of contract renewal.
 - Replacing lighting with LEDs.
 - Reducing travel and encouraging walking, cycling, public transport, liftsharing.
 - Developing replacement plans for equipment (e.g. ageing heating systems).
 - Harder changes – Plan longer term, more expensive interventions for those high energy consuming/high carbon emitting buildings:
 - Developing an estates strategy for schools, clergy housing etc. and investing.
 - Creating business cases, ready to apply when funding opportunities arise.
 - Installing insulation, appropriate to the age and nature of our buildings.

3. Plan for net zero emissions

The **Energy Footprint Tool** (<https://www.churchofengland.org/about/policy-and-thinking/our-views/environment-and-climate-change/about-our-environment/energy-footprint-tool>), a useful and easy-to-use tool that allows all churches around the country to determine their carbon footprint, was introduced in 2020 by the Church of England and accessed via the Online Parish Returns System. This figure provides a useful 'benchmark' and can be examined at appropriate intervals or following key interventions. Energy consumption – and the associated carbon footprint – vary considerably from church to church, with those of larger, busier churches being much higher. The average footprint of a large, urban church building such as ours is about 22 tonnes of carbon dioxide equivalent (tCO_{2e}) per year. Our figure for 2020 was 21.4

Recommendation #2: *Re-measure our carbon footprint with the Energy Footprint Tool and report results through the APCM.*

The Diocese of Oxford is pursuing what is referred to as a 'fabric first' approach. This means implementing measures to improve efficiency, before investing in or recommending new technologies. As these technologies are tested and become more financially viable, the Diocese expect to be able to support churches to implement them.

As a next step, it would make sense to arrange for an **on-site energy audit** of the Church and the Parish Rooms. The auditor would undertake an inspection to see how we are using energy and where we might make savings. This would provide a chance to chat with them about our needs. Subsequent to the visit, the auditor would provide a full report with recommendations for both energy efficiency measures and new technologies as part of a 'pathway to net zero' tailored to our situation.

The Diocese is subsidising such energy audits as it wants every church to be able to get the advice they need. In addition, to help individual churches implement the auditors' recommendations, grants are available from the Diocese that will cover the amount paid for the audit, aiming to make the whole process cost neutral to the PCC. General guidance, including the **Practical Path to Net Zero Carbon** (https://www.churchofengland.org/sites/default/files/2021-01/PP2NZC_SelfGuidedChecklist_onscreen_version.pdf), is also provided free of charge by the Diocese, drawing on resources provided by the national church and other sources. For on-site audits in 2022, churches pay £150 and the Diocese pays the rest of the cost. Recipient churches can also receive an implementation grant of up to £300. Such an energy audit would enable the PCC to plan a programme of work, identify if projects can be aggregated for cost-saving or to obtain funding and to optimise funds, skills and resources.

Recommendation #3: *Arrange an energy audit via the Diocese and use the Practical Path to Net Zero Carbon as a starting point for an Action Plan.*

4. Routine maintenance

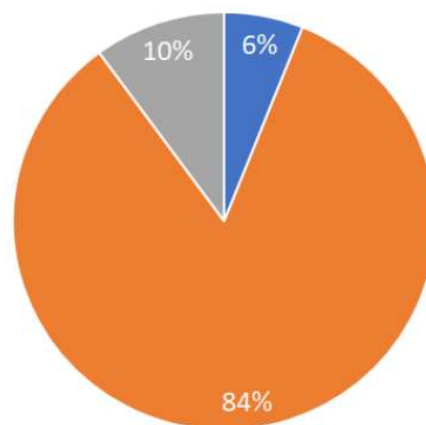
The Fabric Committee of the PCC is responsible for the maintenance of the fabric of the Church, the Parish Rooms, and the Churchyard. The Committee meets and reports monthly to the PCC, addressing all maintenance matters in a thorough manner. A budget is agreed on a yearly basis.

5. Reduce energy consumption through efficiency measures

While energy consumption patterns vary considerably from church to church, analysis undertaken in 2020 of a programme of energy audits of CofE church buildings and halls indicates that space heating makes up the vast majority of a typical church's energy use – some 84% in the sample analysed – with a further 6% use for lighting and 10% for other purposes (e.g. domestic hot water, audio-visual equipment, other electrical equipment etc.).

Percentage of total church energy use
(sample = 126 churches and halls)

■ Lighting ■ Heating ■ Other



From the above, it follows that the greatest area for potential efficiency saving is in space heating.

Heating

The urgent replacement of the ageing, inefficient, non-condensing, existing gas-fired boiler (together with the defunct heating controls), and the replacement of the existing, predominantly old-radiator-based heat distribution system with an under-floor system within the next few years, is addressed in Section 6. Clearly, this will make for a much more efficient system that is more in-line with the stated intention of the CofE Routemap to *“change our default starting point from heating the church (space heating) to making people comfortable (people heating), while protecting our historic interiors from damp through good maintenance.”*

Other efficiency measures that can be considered once the new boiler has been installed include optimising heat settings, adjusting boiler settings to optimise efficiency and

longevity, reducing background heating hours or temperature, draught proofing (although opportunities for this are limited in a large, Grade I listed church) supplemental electric heating for certain areas of the church, etc.

Lighting

Incandescent lightbulbs are being gradually replaced with low-energy (i.e. compact fluorescent) bulbs, with proximity infrared sensors used to activate LED lighting in the North Aisle. Replacing all church lighting with LED lamps and fittings (with appropriate daylight sensors etc.) is addressed in Section 6.

Other

Domestic hot water provision to the washrooms and utility room in the base of the tower, and to the sacristy, is from point-of-use (i.e. 'geyser') electric water heaters which are highly efficient.

The audio-visual systems (i.e. sound system, camera system, projection and relay monitors) are all relatively new (2017 – 2019), with equipment specified to be fit-for-purpose while being energy efficient. For example, while a high-power (7000 Lumen) widescreen projector was selected, this was necessary to be functional for operating in back-projection mode in the brightly lit nave, and a high efficiency LCD Panasonic model was selected to reduce electricity consumption.

All other electrical equipment is either of a low-energy design, or used very occasionally or for short periods.

The opportunity to switch to 100% renewable electricity is addressed in Section 6.

6. Opportunities

Heating

The main 'opportunity' (necessity) in the near future is to replace the existing inefficient gas-fired boiler and predominantly radiator-based heat distribution system with a new heat source and heat distribution system.

Originally, this was intended to be undertaken as a single installation as part of our 'Building to Serve' church development and re-ordering project during the 2020s. However, the existing Hamworthy boiler (an obsolete 'Shaftesbury' model with a maximum rated output of 440kW, believed to date from 2000) has failed. On inspection by Commercial Boiler Services Ltd in October 2021, the recommendation was to replace the boiler. The existing heat distribution system comprises 23 radiators of various shapes and sizes, plus trench heating at the front of the Nave area.

In 2019, in the context of a feasibility study for our reordering project by our Architects, we made a commitment to address sustainability in designing a new heating system. In pursuit of this objective, we immediately commissioned a report from building services consulting engineers Environmental Engineering Partnership in which the potential of all forms of renewable energy for use in the church was considered in detail. The conclusion was that, while the use of either ground source or air source heat pumps could provide a useful contribution to the heat input required to run a (much desired) underfloor heating system, only the retention of a gas-fired boiler in addition to such an installation would provide the means to achieve acceptable air temperatures when the church was in use. With the objective of maximum sustainability still in mind, but in the context of the rapidly failing boiler, in 2022 we commissioned consulting heating engineers to specify an efficient replacement gas boiler that would incorporate the best options for the future development of fuel. Therefore, taking the best professional advice, we have set out on a path to reduce our carbon footprint as much as possible.

The replacement gas-fired boiler specified by our engineers (to be installed late 2022) is a floor-mounted Remeha Broag (Baxi) 210 Eco 6-section 200kW condensing boiler. This boiler has an excellent turn-down ratio and has a very high efficiency (95.2% gross calorific value basis) and very high environmental performance (e.g. very low emissions of Class 6 oxides of nitrogen (33mg/kWh @ 0% oxygen dry). Notwithstanding the inefficient operation of the ageing existing 440kW non-condensing Hamworthy boiler, the specified boiler will supply an equivalent heating load for less than half of the rated power input – a considerable reduction in gas consumption and carbon dioxide emissions produced.

Despite these credentials, the new boiler – which will be installed late 2022 – and fired with natural gas is regarded as an emergency and temporary solution in terms of the move towards net zero. Having said that, it is capable of burning biomethane/biogas (which may be considered in the medium term) and up to 20% hydrogen in the natural gas supply (currently being trialled in Gateshead and Keele) without modification, and could burn 100% hydrogen (a longer term potential solution) if retrofitted with a modified burner unit.

Other primary heating options have been considered but discounted as solutions in our circumstances: Electric heating via high-level radiant heaters would be expensive and of reduced effectiveness in a large, high and poorly insulated space (and unlikely to be acceptable in a Grade I listed Historic Church); a biomass-fired boiler would be impractical as it would be too large for the existing Boiler Room and would require considerable additional storage space for woodchip fuel; air source heat pumps alone would be impractical in a large, poorly insulated space (although might, in air-to-water mode, provide supplemental pre-heating of water to the boiler); ground source heat pumps (if boreholes were allowed in a 'closed' churchyard such as ours) would need to be in a multi-stage configuration and would be very expensive (note that one of the potential installers of the new boiler advised that a multistage heat pump arrangement with a coefficient of

performance of 6.5 would cost in the order of £500,000 and would still not be able to keep the church warm); and solar thermal roof panels (if it were possible to mount these on a Grade I listed church, and bearing in mind that all of our south-facing roof areas are visible or in the shade of the Knave walls) would not provide sufficient high-grade heat consistently.

It remains the plan to replace the existing radiator/trough-based heat distribution system with an underfloor heating system as part of the Building to Serve project. The new gas-fired boiler will have a localised primary circuit with an external heat exchanger to transfer heat to the secondary underfloor circuit, enabling the heat source to be changed at a later stage should a more appropriate net zero option be identified.

Advanced heating controls, incorporating 'frost stat', timers, etc. are being installed as part of the current boiler replacement project. Installation of remote operation capability (i.e. via internet connectivity) will be undertaken as part of extending the wifi connectivity within the Church building.

Lighting

Replacing all church lighting with LED lamps and fittings (with appropriate daylight sensors etc.) and fitting movement/proximity (infrared or microwave) sensors in areas of the church such as the washrooms in the tower, the sacristy/kitchen, etc. is intended as part of the Building to Serve project.

Other

Switching our electricity supply one that uses 100% renewable ('green') energy sources represents an 'easy win' in terms of decarbonising our energy use. As of Q2 2022, this is difficult due to turmoil in the energy markets. When this settles, switching to green electricity is an affordable swop from standard 'brown' grid electricity supply. Analysis by the CofE of the first year of the Energy Footprint Tool suggested that churches could reduce their collective carbon footprint by some 22% through this step alone.

Offsetting residual carbon emissions

Although the Church can reduce its carbon footprint significantly through the above measures (and indeed become net zero in terms of its electricity usage), the fact that natural gas will continue to be used for most of the heating load in the short- to medium-term, means that there will be residual carbon emissions. Moving to net-zero emissions in line with General Synod and Diocesan targets will therefore require these emissions to be 'offset' by either purchasing verifiable carbon credits (e.g through 'gold standard' schemes such as those run by Climate Care in Oxford (<https://www.climatecare.org/>), Ecoshere Plus (<https://ecosphere.plus/>) or investing in assured environmental initiatives that quantify and

certify their carbon savings such as the Woodland Trust in Oxfordshire (<https://www.woodlandtrust.org.uk/support-us/give/personal-carbon/faqs/>), the National Trust (<https://www.nationaltrust.org.uk/features/capturing-carbon>), Mikoko Pamoja's mangrove restoration in Kenya (<https://www.mikokopamoja.org/>). We might consider a range of organisation/schemes, perhaps linked geographically to our church partnerships. Or, we could perhaps 'think local', e.g. liaise with nearby FarmED (<https://www.farmed.co.uk/>), which is offering practical advice to local farmers about improved soil health and opportunities for local offsetting through improved hedgerow management.

7. Wider sustainability considerations

This strategy has been focused on how we might, as a Church, transition to net zero emissions. Furthermore, as the vast bulk of our carbon footprint as a Church relates to our energy usage, the measures above have been focused on decarbonising our energy usage.

Wider aspects of Church life that impacts our total carbon footprint, plus wider still aspects around environmental sustainability (e.g. water, waste, production/consumption, etc.) also warrant consideration.

The **Eco Church** initiative of A Rocha (<https://ecochurch.arocha.org.uk/how-eco-church-works/>) may well be a useful focus for this. Note, the Diocese of Oxford is an 'Bronze' level 'Eco Diocese', and many other churches in the Diocese are Eco Churches.

Recommendation #4: *Investigate registering as an Eco Church and working towards 'Bronze' level.*

There has already been some discussion about the Churchyard being developed into a 'Forest Garden', and aspects of the grounds being used to add further dimensions to our prayer and worship activities (e.g. prayer places, nature trail etc.). This could be synergistic with the vision and design for the garden of The Branch.

8. Next steps

It is suggested that this 'Outline Strategy' (once edited and completed by the Fabric Committee) be discussed by the PCC.

Once the four recommendations above have been followed through and the results of the energy audit are available, a more detailed Net Zero Strategy (perhaps within a wider Sustainability Strategy) can be developed.

Approved by Fabric Committee and Standing committee for endorsement by PCC
07/11/2022