



This update includes references to the APPENDIX below, including footnotes.

We are grateful for the opportunity to clarify our considered journey so far in our commitment with Hereford Diocese to Net Zero carbon by 2030.

The Oil-Fired boiler at St Paul's Church has been condemned and will need replacing.

As an eco-church we are committed to finding the most environmentally friendly solution for every project. Given the nature of the church building and its surroundings there are inevitably practical considerations that will come into play.

Options for heating:

1. Oil fired boiler.

This presented itself initially as the most straightforward solution – a like for like replacement of the existing boiler with an inevitable upgrade in efficiency as technology has improved greatly since our last boiler was installed. There would also be the option to replace the burner with one compatible with Hydrogenated Vegetable Oil (HVO) at a later date – assuming that the cost of this would come down to an acceptable level.

The downsides for this system are the continued burning of oil at a time when we need to be reducing our environmental impact, the fluctuating cost of oil on the global market and concerns about the production processes and delivery of HVO – If produced from palm oil or waste from palm oil production, HVO could contribute to deforestation and high carbon emissions. One of the companies from whom we have sought a quotation has also informed me that they will no longer be supporting oil-fired systems from 2024. **See APPENDIX A1**

2. A system powered by renewable energy sources.

There are many options available:

Biomass heating – This system would be comparatively expensive to install and require weekly maintenance. The majority of wood pellets used in Biomass are imported from Canada and the USA. **See A2**

Solar power – The church has commissioned a sky/sunshine survey. The peculiar roof architecture and shade from overhanging trees mean that solar power is not a feasible option. **See A3**

Heat Pumps **See A4**

- **Ground Source Heat Pump** – An expensive option that is not immediately practical as it would require the clearance of a portion of the graveyard.
- **Air Source Heat Pump** – Unfortunately an Air Source Heat Pump will not produce the required temperature for the church: <https://infinityenergyorganisation.com/air-source-heat-pumps-for-residential-vs-commercial-use/>

Other options – **See A5**

3. A Hydrogen Ready Gas Boiler

Environmentally this option has much to recommend it as the boiler we would look to install is much more efficient than the current system and is also ready to run off Hydrogen in the future. It can also feed in to the existing radiator infrastructure. **See A6**

Practically the boiler will have the capacity to heat the church quickly to an acceptable level for a short space of time e.g. a Sunday morning service in December.

Financially while this option is not the cheapest available but it marries financial, practical and environmental considerations. It is also inbuilt with a degree of future proofing as new gas technologies are developed. **See A6**

Given the presentation of these options the PCC voted unanimously to install a new Gas boiler.

The church does not currently have mains gas so a spur would need to be installed. The church has commissioned a survey by Cadent; they have proposed a pipe to run from the gas main to the front of the church. We have identified an unobtrusive site for the meter kiosk.

A gas pipe would then run under the floor of the church at exposed points, and otherwise hidden under existing large bore water pipes to the vestry where the boiler would be housed.

Quotes for installation have been obtained with a view to installing the spur in the Spring and the heating system over the Summer.

APPENDIX (April 2024)



A1. Leaving Oil

Oil, and previous enthusiasm for HVO, are a strong example of the widespread problem of fads giving rise to unintended consequences more serious than the original problem. There is no current oil solution not leaving significant further pollutants on top of CO₂, and production of HVO has significantly accelerated destruction of Amazon rainforest. And yet only recently it appeared a responsible and environmentally friendly option.

To quote current CofE advice¹:

We must all consider the impact of our actions and ensure that we are not addressing one environmental challenge by creating another. The Church Buildings Council, therefore, does not support the adoption of HVO as part of the move to net-zero carbon until such a point as these issues are resolved beyond doubt.

A2. Biomass

In addition to considerable doubts about sourcing and its Carbon footprint, the technology is not mature, and requires considerable maintenance, needing either significant local volunteer skills or costly call-out contracts. Investigations locally illustrate this, as one Diocesan parish (Yarpole) has had to remove their costly Biomass system due to lack of such ability locally.

Our assessment is that the high capital cost would be right now a bad investment for St Paul's – very likely being a decision we would regret in a few years' time, as understanding further develops, and international consequences become clearer.

A3. Solar Power

Since forming our Eco-team (leading so far to our Silver EcoChurch award 2022), we have been committed towards achieving Carbon Net-Zero (NZ) by 2030 – preferably through our own portfolio, though of course accounting for any remaining carbon through offset schemes such as *Climate Stewards*.

A survey of our full roof options in 2018 by Nick Walker showed unfortunately that at that time no part of our roof structures would provide sufficient direct sun exposure to give reasonable payback of the installation. It was therefore not the right focus – awaiting further options and reduced PV panel pricing, which of course is appearing now.

¹ <https://www.churchofengland.org/resources/churchcare/advice-and-guidance-church-buildings/hydrogen-and-hydrated-vegetable-oils>

Clearly solar power would not at this stage provide church heating without a vast battery, even if we had a present solution. But in the longer-term, there is a strong opportunity for a joint project with our adjacent CofE school St Paul's. As schools are the largest carbon source for our wider diocesan (and CofE) NZ commitment, this seems the clear strategy, especially as we own the school land which adjoins the churchyard, and the fence 100m long is south-facing in direct sun.

A4. Heat Pumps

Here, the degree to which the church is used through the week becomes important, as most heat pumps are unable to deliver high temperatures at radiators needed to heat the building rapidly.

St Paul's typically requires a warm church 1-3 times each week (depending on Occasional Offices), with a lower heating level (12°C) desirable a further 3 times weekly for school/nursery events.

Experience shows that buildings requiring a constant low level of heat are very efficiently heated using heat pumps – eg. cathedrals, abbeys and tourist venues. However, this is not our need. With Coefficient of Performance (COP) typically 4.0 for **ground source**, but under 2.0 for **air source**, the need to have heating on probably many times longer would completely undermine the COP advantage, hence defining a system using *more* energy than at present, but using electricity leading to likely running cost 4 times higher, on a system with very high capital cost, and associated high Embodied Carbon².

Instead, using a proposed 100KW gas boiler (with COP > 0.9)³ will enable the building to be heated in 2 hours prior to a main event, resulting in an estimated use of just 7-10 hours heating per week covering all events.

Ground source heat pumps, while costing £30-50K more (using trenches), are the only option with the required efficiency for us, and able to deliver temperature differentials even in very cold weather. But advice in 2018 revealed that there is insufficient unused space for trenches in our very full burial ground without disturbing graves⁴.

A5. Other options.

1. During this winter, we have borrowed 4 **high-level radiant electric heaters** (2KW), which give local heat to the adjacent chairs. This provided a partial simulation of larger overhead radiant electric heaters providing an efficient solution in some circumstances. It seems they have been the right solution where a building is far larger than the capacity needed, so that typical congregations can be accommodated under a few heaters, rather than heating a large volume of air.

This is *not* our main use. Each week, the church is completely filled with 240 children one day, and main Sunday worship sees up to 100, typically filling the main part of the nave.

Hence, St Paul's is *not* a building far larger than the capacity needed.

Further factors noted in our evaluation discussions were:

- a. We would naturally need a completely new electrical system.
 - b. Many, though cold, have stayed *away* from the radiant heaters, finding heat above (and none below) very uncomfortable, unwelcoming and distracting.
2. Other **local heating solutions** are also suitable where small numbers of people use a large building – especially where there are fixed pews. **Our seating is entirely movable chairs** on a fully carpeted floor. Naturally any **fixed** local heating is unsuitable.

² The term *Embodied Carbon* is used to denote equivalent CO₂ output through manufacture and installation of a system; correspondingly the term *Operational Carbon* arising from running the system through its life.

³ A possible supplier, who have serviced our defunct oil boiler for 10 years, estimate realistic performance better than 90% efficient for a proposed new [Bosch Condens7000 WP](#) (100KW), and 60% for our old boiler.

⁴ St Paul's was built in 1865, and most graves, unlike around older churches, relate to current families and traceable sensitivities.

We had not considered **heated pew cushions** – using rechargeable batteries⁵. Leaving aside the ecological nightmare or periodic disposal/replacement of up to 200 batteries, this again fails to match our church use. They could be useful where a small number of people meet occasionally in a large empty building otherwise not justifiably or practically heated.

A6. Gas and its future

The possible options and sources of Hydrogen and partial Hydrogen were well summarised in the advice documents, especially regarding Decarbonisation.⁶

The CBI included in a noteworthy summary that *‘there is not a one size fits all solution...’*⁷

More recently, recognising current CofE general advice since the 2022 Synod amendment⁸, we have considered also the principal source document of this (*Second National Infrastructure Assessment*, Oct 2023), reflecting one possible solution in a very uncertain political landscape.

While government policy will be highly dependent upon political tides including 2024 election outcomes, industry can at times coordinate more clearly. So, for example, gas boiler manufacturers have moved faster than anticipated in being universally biogas and Hydrogen-ready, and *Hello Hydrogen*⁹ represents the coherent voice of our gas infrastructure.

A7. Interim or Long-term solution?

In our discussion, arising from 5 years prior commitment to Eco-church and its associated long-term journey, we fully recognise that it is not at this time possible to choose a reliable and sustainable carbon-neutral solution, and further that we would find a different solution in 5 years’ time – when we had anticipated needing to do so.

We remain committed to being a Net-Zero (NZ) parish by 2030, and to a portfolio (*see A3* above) enabling this to happen. We also require heating for winter 2024-5 which expresses our welcome in the mission of Jesus Christ to the wider community, and fully believe that an A-rated 100KW gas boiler is the correct solution at this time. Given a diversity of possible local and national developments using gas, some measure of reduced net carbon output is likely in the 15 years ahead, and at best it is possible that this installation could continue to the boiler’s lifetime. But if not, the relatively low Embodied Carbon and financial investment now will then provide a clearer and more robust, reliable solution to our needs than is available now.

A8. Energy Toolkit report

We have collected energy data for St Paul’s since 2020 (though excluding 2022) to the end of 2023.¹⁰

Clearly this will provide a vital baseline on our journey towards Net Zero ahead.

But the [report](#) does need some explanation. Besides the irregularities of the pandemic during 2020-2021, on returning we help worship outside during much of 2021. Furthermore, we agreed in PCC November 2022, while having the present heating system, to reduce our carbon footprint each winter by moving to the gas heated Community Centre during Jan-Feb (2023, 2024). This, along with the loss of our church boiler August 2023, accounts for the reduction in oil-based carbon emissions. It also brought a slight increase in gas-based carbon emissions in the Community Centre, though most of the present gas use is due to our full-time Childcare CIO running there Monday to Friday.

⁵ <https://www.churchofengland.org/media/27414>

⁶ https://www.churchofengland.org/sites/default/files/2023-05/Heating_Decarbonisation_and_the_future_of_heat.pdf
See pp6-7 on Hydrogen, and p8 recognising combined and variable gas solutions.

⁷ *ibid. p8 recognising combined and variable gas solutions.*

⁸ <https://www.churchofengland.org/resources/churchcare/advice-and-guidance-church-buildings/hydrogen-and-hydrotreated-vegetable-oils>

⁹ <https://www.hellohydrogen.com/about-us/>

¹⁰ <https://drive.google.com/file/d/1TosL4dg1oqcqHk-tu3AQJ-SwAE9IzzbZ/view?usp=sharing>