

LOW-COST, LOW-CARBON HEATING INFRASTRUCTURE IN ST MARY'S BEAMINSTER



N.B. This case study considers only one possible approach, which will not be suitable for every church. Always seek professional advice.

Key Points

- Following an energy audit and fresh from achieving an Eco Church Gold Award, St Marys church recently chose to install a new, environmentally-friendly heating set-up.
- By adopting solar panel and heat pump technology, the church has cut carbon emissions and ensured energy bills will remain low in the long-term.
- As a building with much valuable historic fabric, it was important that a new system was sympathetic to the character and worked alongside much existing infrastructure.



1 Two air source heat pumps were installed at the back of the church. With the addition of this enclosure around them, the visual impact is minimal.

2 Independent controls for each heat pump mean they can be used efficiently.

3 Solar panels were fitted to a special mounting system to prevent damage to the lead roof.

The context

St Mary's is a Grade I-listed Medieval church in the Beaminster Conservation Area, in the Diocese of Salisbury. Having been presented with an Eco Church Gold Award in 2020, there was a desire to press on further with carbon savings. As the building itself had been the lowest scoring category in the Eco Church assessment, it became an obvious target for improvement.

For more information visit the [church's website](#), or its entry on the [Church Heritage Record](#).

The need for change

The church was previously heated by a gas boiler connected to underfloor heating and 6 fan heaters.

An energy audit of the church showed that it was consuming 7,500 kWh/year electricity, at a cost of £1,200 and 54,000 kWh/year gas, at a cost of £2,216. The set up was estimated to emit 12 Tonnes CO₂ annually, with 90% total energy usage spent on heating.

What were the options?

- A **biomass boiler** was deemed unsuited to the church, which does not feature the easy vehicular access required for taking frequent deliveries of wood pellets.
- Given that underfloor heating was already in place, an **air source heat pump** system quickly emerged as the most appropriate option to reduce the carbon emissions of the building.

- Running on electricity, the heat pumps would also benefit from the on-site generation of power from an **array of solar PV panels** that was already being planned. Due to the location of the church, backing onto a number of fields on one side, installation of the panels would have little visual impact for the town.

What was done?

- A mounting system was required to fix the solar panels, in order to prevent damage to the leaded roof. This then had to be adjusted when supply issues meant that the panel model originally chosen was no longer available.
- Eventually **40 solar panels, each 400W**, were fitted, producing an estimated 12,873 kWh each year. A bird guard was also added to stop birds from nesting underneath the panels, which, through reduced ventilation, would have reduced overall efficiency of the system.
- **Two 16kW air source heat pumps** were installed at the back of the building. An enclosure was also fitted around these, as mandated by Dorset Council. These were designed with the intention of working alongside the existing gas boiler, as a bi-valent system.

How well does it work?

With the works only completed towards the end of the summer in 2022, the system is still in its early stages of use and the exact output patterns relatively unknown. For most of the time, just one heat pump is needed, with the other coming into operation when the outside temperature is lower. The boiler then provides the next back up, when outdoor temperatures are below 2°C. Both heat pumps and the boiler distribute warmth through water in the same pre-existent underfloor heating pipes.

The electricity generated by the solar panels powers part of the heating when it is on during the winter, for example, on 2nd January 2023 (a mostly sunny day with temperatures between 2 and 9°C), electricity from the solar panels provided just over 21% of that consumed over the day.

During the summer, excess energy will be exported to the national grid to provide the church with an additional revenue source. It is expected that the cost of heating the church will outweigh this additional income, but it will be significantly reduced.

How much did it cost?

- In reality, the costs exceeded initial expectations, totalling **£65,059.43** (Ex. VAT), of which **£24,565.00** covered the solar panels, **£25,637.25** the heat pumps, and the remainder going towards general project costs, including an energy audit and additional architects fees.
- Although VAT took the total up to **£77,874.32**, the church is in the process of claiming the **£12,814.89** difference back.
- A grant was received from Low Carbon Dorset, a programme run by Dorset Council and Dorset Area of Outstanding Natural Beauty, and funded by the European Regional Development Fund. This totalled **£19,371.40**, though the application for this was based on an early estimate of the overall cost (£48,428.50 Ex. VAT). An additional **£10,000.00** had been given as a donation earmarked for solar panels, leaving **£35,688.03** for the church to cover.

“We had achieved Eco Church Gold status in summer 2020 and needed to press on. There were struggles with the installations due to shortages of some items. This was influenced by world affairs. My advice is to have a good team and keep going in spite of complications, struggles getting the Faculty Application right etc. The experience at times was challenging, daunting, protracted & exhausting but great relief when finally finished.”

Dr Gillian Perrott, PCC Trustee