CASE STUDY CREATING A RENEWABLE AND EFFECTIVE HEATING SCHEME AT ST GEORGE'S

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

Key Points

- St George's undertook an ambitious new heating project, spending in excess of £1,000,000 over 10 years to transform the practical capabilities of this 20th century building and enhance its value to the community.
- With vision, persistence and local engagement, the church building has been turned into a carbon neutral, financially sustainable asset, featuring an innovative heating system that now enables great flexibility of use.

1 New pipes were laid under the floor, which was also fitted with insulating material.

2 The ground source heat pump runs on electricity to draw heat from below ground and into two buffer tanks.

3 Solar PV panels generate more than enough electricity for the new heating system, meaning the surplus can be sold and provides a modest income stream.

The context

St George's is a building that was first started in the 1930s but not completed until the 1960s, due to financial constraints. It is an unlisted church located in the outskirts of Newbury in Berkshire.

For more information, visit the church's website or see its entry on the Church Heritage Record.

The need for change

With a large number of new homes being built in the area, and an existing demand from community groups for warm and accessible space, it was determined that St Georges would benefit from a much improved heating system. As one of the original three 40kW boilers had ceased to function and the remaining two unable to heat the building above 14°C, it was clear that a much more efficient solution was needed. Within this, lowering the carbon footprint of the church was seen as the priority. The sum of these conditions resulted in a large-scale overhaul, the benefits of which are now clear.

What were the options?

Specialist consultants were first commissioned to produce reports exploring the potential routes for the team to follow in sustainably heating the church.

- **Biomass boilers** were one such possibility, but ultimately rejected due to the requirements for handling and storing bulky fuel, whilst preventing it from getting wet.

- **Air source heat pumps** presented a more suitable offer, but fell short in terms of output, with a large number needed for this particular building and the decision-makers observing a lack of sufficient suitable sites around the building for installation.
- As a relatively new church, the site of the building was more suited to a **ground source heat pump** than is typical, lacking the archaeological features of a Medieval churchyard, for example.

What was done?

- An important element in the work was to **reduce wasted heat**, lowering the capacity of heating required. A number of steps were taken in doing this, including the installation of **underfloor heating** in a new **insulated floor**, **insulation of the ceilings**, fitting **secondary glazing** on the clerestory windows, and introducing **glazing in the lobby to reduce draughts**.
- **129 solar PV panels** were attached to the roof of the building.
- The previous gas boilers, each 40kW, were replaced with a more efficient **46 kW back-up gas boiler**.
- A **46kW Ground source heat pump** was installed, which feeds into new **twin 750L buffer tanks**, from where the underfloor heating can draw heat**.** The pump acquires heat from a closed-loop system into **7 boreholes that average 120m in depth**. While the heat pump itself does not produce 'on demand' heat like a boiler, it can run a more efficient system by virtue of these buffers. To begin with, issues emerged in the implementation, which have been tackled with adaptations, such as converting from an open- to a closed-loop system. A significant lesson from the experience has been the importance of having full and detailed contracts, clearly defining liabilities.

How well does it work?

The congregation now enjoy a warmer space, whilst a number of new community groups have begun to use it since the work was completed.

Carbon neutrality and financial sustainability have been achieved through the annual in-house generation of **34,000kWh electricity,** and its implementation in heating. The solar PV panels produce more than enough energy (across the year) to entirely power the new heat pump system. Although seasonal variations mean there is a need during winter to purchase (green) electricity, this is outweighed during the summer, when the sale of surplus energy provides an average annual net profit of around **£900** for the church.

The new gas boiler has been called into action just once, as a result of teething problems with the boreholes.

How much did it cost?

- **£1,042,000** was the total cost, **£454,000** (44%) of which came from internal sources, predominantly congregation fundraising. Meanwhile, the remaining **£588,000** (56%) came from external grants, including a **£50,000** government grant for the solar panels.
- The phased nature of the project was the result of a funding driven plan. Ensuring that funds were available in time for each separate phase was a slower but less risky option than trying to undertake works all at once without the necessary cash in place.
- The heat pump infrastructure and its installation initially cost **£120,000**, though another **£50,000** was required after completion in order to convert it to a closed-loop system.
- The 'roof phase' of work, including solar panels, strengthening the structure and insulating the ceiling, cost approximately **£110,000.**
- The church now also benefits from a feed-in tariff and a renewable heat incentive, coming in at around **£17,000 per year, for 20 years**. This will fall short of paying-back the total cost of the project, though the investment was always considered a gift to the future.

"It was essential that the congregation were fully behind the scheme and that they were kept informed of progress. Regular communication in a manner which was easily understandable was crucial" Bruce Blaine, Churchwarden, St George's Wash Common (Newbury)