

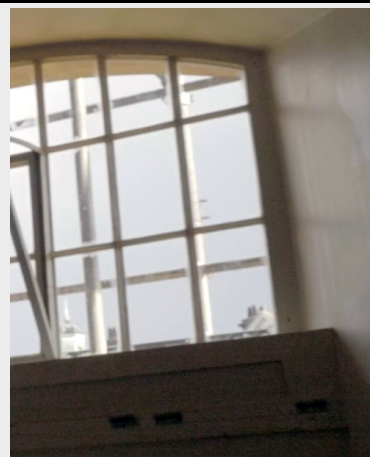
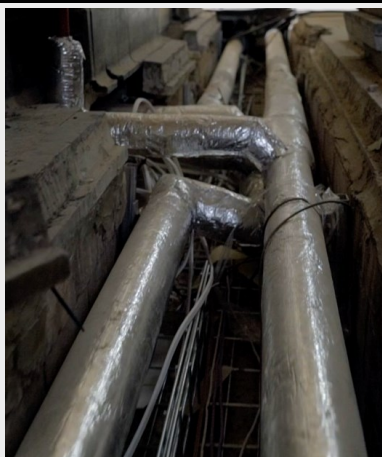
CASE STUDY MAJOR REORDERING AND SOLAR PANEL INSTALLATION AT GRADE II* LISTED CHURCH



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

Key Points

- Grade II* listed St John's, Waterloo has undergone a major reordering, integrating environmental considerations from the very start.
- They have installed a large solar array. Along with electric heating, LED lighting, and all electric appliances, the panels mean their large and well-used crypt is now net zero carbon.
- The main church space has reduced heat loss with draught-proofing and insulation, and has installed new, efficient gas boilers, with the pipework sized in readiness for future installation of heat pumps.



1 100 square meters of solar panels have been installed. They will produce 28,000kwh of electricity per year, enough to light and heat the crypt, and run all the appliances.

2 Larger pipes in the church make it ready for heat pumps in the future.

3 Heat loss has been reduced through double-glazing on crypt windows, plus new insulation in the church ceiling.

The context

St John's is a Grade II*-listed church in Waterloo, London (Diocese of Southwark). Built in 1824, mainly of brick, it is a rectangular building consisting of nave and crypt. The footprint of the church is approx. 600m².

It is a well-used, central London church, used throughout the week for a variety of services and events. In a typical week the church and crypt is used from 8 a.m. to 9 p.m. most days

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

The need for change

The previous heating system had ceased to be viable: it used inefficient boilers from the 1990's for the nave, and oil-fired radiators in the crypt, as the central heating had failed.

The entire building needed renovation; improvements were needed across the building.

St John's has been a leading church on climate change and net zero carbon was considered from the outset.

Watch the video case study

To find the video case study of St John's Waterloo, [click here](#), or go to www.churchofengland.org/environment.

What were the options?

The church team considered several types of heating for the nave and crypt:

- **Conventional gas heating throughout:** this did not achieve the environmental benefits being sought.
- **Air-source heat pump:** for this church, with current technology, heat pumps would not yet be sufficiently efficient to maintain the warmth in the main church space. Larger pipe-work has been installed so that, once heat pumps become more efficient, they can replace the gas boilers for the nave.
- **Underfloor heating:** this would have been invasive and expensive, requiring the whole of the crypt floor to be lifted and re-laid with new concrete, with a high carbon and financial cost.
- The option selected was; **newer, more efficient electric heating in the crypt, and efficient gas boilers for the nave, with heat-pump-ready pipework.**

What was done?

- Passive draft-proofing measures throughout the building
- Additional insulation was installed in the roof
- Double-glazed windows in the crypt
- 100 square meters of solar panels producing 28,000kwh per year
- Efficient far infra-red panel heaters in the crypt
- Electric hot water heating
- 2 efficient gas boilers for the nave, with larger pipework to be heat-pump-ready for the future
- LED lighting throughout
- A new heat-exchanged ventilation system
- New clearer glass installed in the nave, reducing the need for lighting
- Electricity and gas from renewable sources

How well does it work?

It is early days, however the solar panels should provide enough power to heat and light the crypt all year long. Electric infrared heating panels are efficient, requiring little warm-up time.

It's expected that as a result of all the changes, energy use will decrease dramatically, although the church space will be used more often.

How much did it cost?

The solar panels cost £30,000, scaffolding cost was £70,000. This was covered by grants from the Mayor of London, trust and foundations, and donations from the congregation.

“We tried to make the buildings, within the cost constraints, as good as it can possibly be, so that we can achieve net zero carbon by 2030 at the latest. We’re anticipating that because of all the work, our energy use will reduce dramatically, and I’m very sure it will cost us less to run the building, even though we’ll be using it much more.”

—Vicar, St John’s church, Waterloo