

St John's Church, Waterbeach: Proposed Churchroom heating system

Statement of Needs

1 Introduction

Waterbeach is located approximately 9 km to the north of Cambridge city-centre. The village population in December 2018 was about 4900.

Recent housing developments completed to the north of the village, now fill the strip of land between the northern boundary of the ancient village and the former RAF Waterbeach. These developments alone have brought an increase in the village population of about 1000 also resulting in a younger demographic. Because of its proximity to Cambridge, Waterbeach remains a popular location with a growing number of new residents who find affordable housing within easy reach of Cambridge. The result is an increase in the number of young families in the village with a corresponding interest expressed in Church supported family activity. These changes are already increasing attendance at St John's.

The former RAF Waterbeach (which from 1966 to 2011 as "Waterbeach Barracks" was the home of the Royal Engineers) is now under development by Urban&Civic as the western zone of Waterbeach New Town. The area to the east will be developed by RLW Estates, a joint venture of local landowners and Royal London Insurance. The COVID pandemic has forced a re-evaluation of urban living and the timing of the Waterbeach developments could well be timely in helping meet a housing demand from those looking to leave London. In the western zone alone 6500 new homes are planned.

Since St John's will remain the Parish Church of this growing community One thing is certain – that the Church will remain a location for worship and community activity. A modern heating system is one aspect of a "green" character that St John's wishes to project as evidence of a caring approach to creation. Its impact will be seen alongside other local initiatives including encouragement of active travel and support for low carbon lifestyles.

2 Heating of the Churchroom

Since its construction in the 1970s, the St John's Churchroom has been heated by means of a system of wet radiators supplied by a gas boiler. The updates to the Churchroom completed in 2001 added a kitchen and office and a new "combi" boiler. This boiler feeds a system of eight radiators and supplies hot water. In the opinion of the company we employ to service the boiler, it is life expired and St John's PCC (Parochial Church Council) has been investigating a replacement.

St John's commissioned an energy survey from the company "Green Journey" in 2017-2018 as part of an Ely Diocese initiative. The survey identified the boiler currently installed in the Church Room as an older style non-condensing boiler rated at 35kW. The recommendations included a condensing boiler to increase efficiency – and either ground source or air source heat pump as a more "advanced" replacement. In addition the survey also stated: "*Because of the location of the site and construction of the roof, there is scope for St John the Evangelist Church to consider the installation of solar PV panels.*" The recommendation included the installation on the southern roof of the Church Room of nine panels offering about 3kW rated generation.

In an options assessment, St John's has considered (1) installation a new gas boiler – with the hope that a "hydrogen option" will become available; (2) a ground source heat pump; (3) an electrically powered air-source heat pump. (1) we felt was too speculative; there are strategic developments at a national level, but no timetable for replacement of natural gas with hydrogen fuels. (2) is not feasible in the churchyard without significant expense and the lengthy process of archaeological investigation of the churchyard during excavation work. (3) was most favoured by being both "green": we can supply at least some of the electrical power from solar panels –

and practical: we can retrofit to our existing wet radiator system. Heat pump systems deliver energy at lower temperatures than gas boilers. The lower temperature operation gives heat pumps a significant thermodynamic advantage, but means that energy output needs to be planned and room temperatures controlled over longer timescales than would be the case with a gas boiler. We believe this need to plan the operation of the ASHP in detail is consistent with the scheduled usage of a community space such as the Churchroom.

Since energy forms the largest element of the costs associated with the Church Room, reduction in energy cost (through solar PV) and the reduction of carbon footprint (by removing the gas boiler and adding solar PV) will be well received by those using the rooms. St John's is a member of the Eco Church scheme under which publicity on the part of the Church is encouraged to demonstrate the benefits of "eco" initiatives. The kind of new energy schemes represented by the solar PV + heat pump is considered "significant" in the Eco Church assessment (that is about 20% of the difference between Bronze award – our current status - and Silver).

The building heat loss has been estimated in the worst case as 12.5kW. There are some insulation measures that need to be improved – notably some installation of double glazing and attention to one poorly fitting door. The proposed ASHP is rated at 14kW which gives a margin, but one that will fall as further steps are taken to improve the building's thermal performance. Effective operation will require long term predictive management that will be offered by a "smart" control system.

An additional requirement for any energy system is monitoring: to check that the performance being delivered is according to the initial design and also to detect whether anything is going wrong. St John's wishes also to use a monitoring system to observe energy flows with a view to identifying the need for battery storage in the future. A monitor displaying energy usage will be displayed on Sundays and at special events and will help explain the benefits. The data will also be available to share with the wider community. We are proposing to install and program an open energy monitoring system (see <https://megni.co.uk/>). Our wish is to encourage use by Church youth groups and local schools for investigations and project work on use of energy in buildings.

3 How this development relates to other proposals for improvement to the Church fabric

Generally Churchroom developments take place independently of any work on the fabric of the Church building. The area of roof that connects the Churchroom with the Church's south door is scheduled for replacement in the next six months. One important aspect of the replacement work is to improve the thermal performance of the roof and allow the installation of a new radiator (on the ASHP circuit). The proposed system is sized for this, and the improved roof insulation will result in a higher local temperature in the lobby area.

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