

St Andrews CofE Primary School

Net Zero Carbon Project



St Andrews CofE Primary School, Chedworth was successful in obtaining a £120,000 grant through the government's Public Sector Decarbonisation Scheme to transition to a Net Zero Carbon school by reducing its energy demand through LED lighting and insulation measures and then generating its heating and power through an air source heat pump and PV panels. The school was previously reliant on an oil boiler to provide its heating (being in a rural off gas location) and have now undertaken a complete conversion to the use of air (to water) source heat pumps and removed its end of life oil boiler and tank.

The works were completed by end of March 2021.

The project has resulted in the school being net zero carbon with its residual energy demand being met from a 100% renewable electricity supplier. The project will save 15.49 tonnes of CO₂e per year and provide financial savings of £4,500 per year to the school.

The project was managed by Inspired Efficiency, who helped the school to obtain the funding which was administered through SALIX.

Project Details

The school had worked to reduce its environmental impact over the years and through a range of previous works that the school has carried out it had already moved its hot water away from the oil boiler to electric point of use units with timeclocks. It had changed around 50% of its lighting to LED over the past 5 years and had double glazed windows in around 70% of the school.

The net zero project aimed to reduce the heating and electricity demand of the school before then seeking to generate its remaining heating and power needs from renewable and decarbonised sources,

To reduce its demand, it has:

- Replaced its remaining single glazed windows (which could not close properly!) to double glazed well sealed units.
- Injected cavity wall insulation into the walls of 3 classrooms, where the school was extended in the 1970's and where therefore unfilled cavity wall construction
- Added insulation beneath the suspended timber floors of the original Victorian school building
- Installed new suspended ceilings into two classrooms which had exposed ceilings. These have reduced the heated air volume of the classrooms as well as reducing draughts from the wall and roof junction
- Installed insulation above existing suspended ceilings to the staff room and other areas of the school which have a pitched roof above with no insulation.

The heating and electricity needs are then being decarbonised by:

- Installing an air source heat pump to entirely replace its old oil boiler which, along with the large oil tank, has been removed
- Installing a solar PV system on to the school halls roof to generate around 40% of the total new electricity demand from renewable sources. The PV panels will generate enough electricity to serve all of the schools lighting and small power needs (including hot water) and about 25% of the new ASHP. The solar PV has been installed with a 5kW battery to extend the useful power generation into the evenings.

Details of works

All of the LED lighting has been installed throughout the school including the main school hall which previously has T8 fluorescent lighting. The lighting works are forecast to reduce the lighting electrical usage by 64%, saving over £1,000 per year in electricity.



New ceilings have been installed in two of the classrooms. This has instantly provided a reduction in the air volume of the room that needs to be heated and prevents cold draughts from the wall/ceiling junction of the previously exposed ceiling construction. The new suspended ceilings also allowed for the optimum lighting distribution for the new LED lighting panels with teaching staff noticing an immediate improvement in the thermal environment of the classroom and also much improved lighting quality and acoustic qualities of the space.



The insulation to the walls, floor and ceilings has been installed and fully completed. Combined together with the window replacements these measures are forecast to reduce the heating needs of the school by 23% and allow the new air source heat pump to operate more efficiently.



New double glazed windows have been installed into all areas where there were previously ill-fitting single glazed units. These were all to the older part of the building where there were metal casements in stone mullions. The new steel window casements have been designed to fit in with the heritage appearance of this section of the school and subtle modifications with the new installation have also moved the opening lights to the main lower sections rather than the previously pivot turn opening lights of the top sections. Not only has this reduced the heat loss and very high draught levels within these rooms (as the previous top opening lights failed to close properly), the new windows are also much easier and safer to open and allow increased levels of ventilation into the rooms when open, which help to address summer time over heating and high ventilation levels to reduce viral risk.

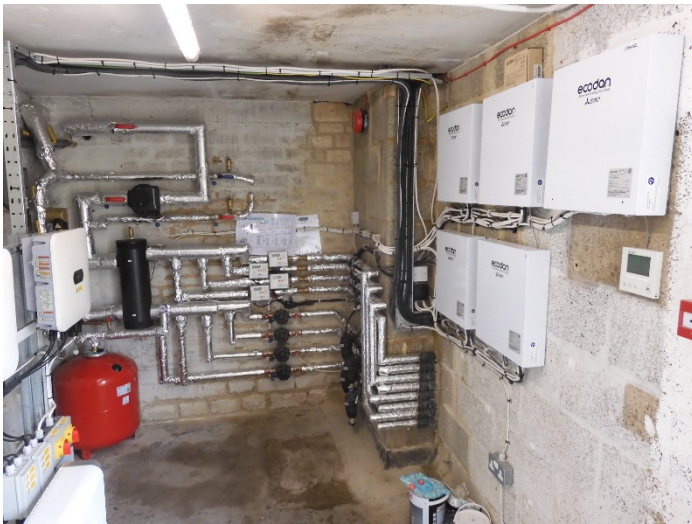


The PV panels have been installed comprising thirty 370W panels producing an 11.1kWp PV array generating 10,383kWh per year. This has been sized to best correspond to the schools electrical usage and is expected to have 95.3% of the energy generated used on site by the school thus avoiding export. To achieve this the system has been installed with a 5kW battery. The inverter and battery system were supplied by Huawei and are the first installation of this kind in the UK.



The air source heat pumps have been installed comprising of four 14kW Mitsubishi EcoDan units. These connect onto the existing heating system within the school that comprise of underfloor heating to the school hall and radiators to the classrooms and other areas. The system is set to run with a weather compensated 45°C max flow temp which has been proven to be successful at heating the school through a combination of the improved insulation and an increased optimised start time in the mornings. The system is turned off overnight and through weekends and holiday periods. A full case study on the ASHP can be view on the Mitsubishi

website at [St Andrews School - Chedworth - Document Library - Mitsubishi Electric](#)



The existing boiler and oil tank have been removed and disposed of.

The controls, and distribution pumps for the new air source heat pump have been located in the existing boiler room of the school.

Adjustment and Challenges to Project

The incoming electricity supply has raised a few challenges. SSE had originally advised that 3 phase supply was available and could be installed for £300 connection fee. After the order was paced for this they then advised that the 3-phase was not available locally and there would be £18,500 of network reinforcement costs required to connect the school!

An alternative solution has been developed whereby a second single phase connection (which was already connected to the school) was re-energised (for no cost) and the specification of the heat pumps adjusted to a single phase rather than the 3 phase version. This has required some additional sub mains distribution in the school.

The knock on effect of this is that the original 40 panel PV system was too large to be connected to the two single phase supplies so the PV solution has been revised to a 30 panel solution, which is connected via a battery storage system, the battery storage allows for all 30 panels to be installed and linked to both supplies as well as giving additional benefits of spreading the generation over longer periods through the storage arrangements. The battery storage system

also allowed for a fast track DNO approval route to be allowed, meaning the system could be connected into the grid in line with the funding programme.

The bureaucracy of the funding has also been a challenge with initial delays in the approval of the funding resulting in a late start to the project then frequent additional forms being required through the projects development. The release of the funding has been a highly significant issue as this is a long winded process and resulted in payments being processed with a delay of around 8 weeks.

Planning was required for the PV panels and the air source heat pumps as the school is in a conservation area. The school is not listed nor does the directly neighbouring property have any form of listing. It was of some frustration to note that the installation of an air source heat pump is not currently included as an allowable item under the permitted development rules and that the PV panels were considered as being facing a highway when the roof is round the side and back of the school. Fortunately, the planning application received a high level of public support and no objections and with the aid of local council members permission was granted just within the timescales required.

Additional Project Benefits

The project has generated additional benefits in that:

1. The existing T5 lighting, which was removed for the new insulated ceilings and LED, still had good life left within the fittings and these were donated to the local Silver Band to replace their existing old and highly inefficient T12 lighting in the band room in the village.
2. The project has inspired people to come forward and offer support and funding for other measures which will allow the school to install a EV charging point in the car park for staff (and out of hours community) use.



The project continues to build on the schools strong environmental actions such as being the community hub for Terracycle and battery recycling and having a long established, 'no mow' wildlife area.



PR and Community Engagement

The project has been announced to the community via social media platforms (NextDoor, Facebook and Twitter) where it has received unanimous and significant community support.

The project features in the Church of England's national press release on 1 year on from its 2030 net zero carbon commitment [One year on: Church moves forward on carbon reduction target | The Church of England](#) and is also published on the Gloucester Diocese and central Church of England websites

The project was featured in BBC Radio Gloucestershire including an interview with Matt Fulford on Sunday 21st Feb.

The project has been published by the Sun [Primary in sleepy rural village becomes Britain's first net-zero school \(thesun.co.uk\)](#) and local press [Chedworth primary school to become one of the first net zero carbon schools in the country | Wilts and Gloucestershire Standard \(wiltsglosstandard.co.uk\)](#)

The project has been published as a case study by Mitsubishi (<https://es.mitsubishielectric.co.uk/case-studies/st-andrews-school-chedworth>) and featured in Renewable Energy Installer <https://www.renewableenergyinstaller.co.uk/2021/05/heat-pumps-key-to-achieving-energy-efficiency-in-retrofit-project/>

Further PR and media work is planned around a launch of the project later in the year once COVID restrictions allow.