CASE STUDY REDUCING ELECTRICITY USE AND CARBON EMISSIONS

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

Key Points

- Taking a 'financial investment' approach helped Portsmouth Cathedral to strike a balance between reducing carbon emissions and spending money prudently as they made changes to Cathedral House.
- Continuous reinvestment of energy-spend savings from micro-CHP (Combined Heat and Power) and feed-in tariff income (FIT) from onsite solar panels helped finance changes and maintain momentum.
- Consistent collection and analysis of energy-use data was key to appraising projects.

1 A micro-CHP plant occupies a small previously unused space in a stairwell. The compact micro-CHP unit uses fuel cell technology to convert mains gas into electricity at very high efficiency with hot water as a useful by-product .

2 The community hall with new energy-efficient LED lighting installed.

3 The rooftop solar PV array, hidden from the streetscape behind a parapet wall.

The context

Cathedral House is a multi-use building owned and used by Portsmouth Cathedral. It is a 1950's building comprising a community hall, admin/social enterprise offices, song/music rooms, and staff flats. As a non-listed building, with very regular use, it made an ideal place for the cathedral to start tackling carbon emissions, with the chance to make relatively quick inroads. For more information visit the church's website.

The need for change

Responsible stewardship of resources, money and buildings was a key goal in the cathedral's 2014-19 development plan. The initial objective was to tackle the electricity footprint, which in 2014 accounted for 51% of energy emissions and 48% of energy spend.

What were the options?

With the help of a consultant, the carbon footprint created by energy use (both electricity and gas) was measured and potential reductions identified via a mix of measures, for example:

- Housekeeping: the review found that lights were often left on in the community hall by different user groups due to confusion over who was responsible for switch-offs.
- Lighting: the building had 150+ CAT2 style ceiling light fittings, an obvious area to address by installing energy-efficient LED flat panels, which are becoming widely available and affordable. *(cont. overleaf)*

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- Energy-hungry IT equipment: the main cathedral server was housed in the admin offices along with the air-conditioning equipment needed to cool it. A better solution was called for (see below).
- Onsite low-carbon electricity generation: the cathedral actively sought options to incorporate onsite low-carbon generation, such as solar panels.

What was done?

- **Installation of a micro-CHP unit** – This generates 13,000kWh/pa of electricity serving the community hall and social enterprise offices plus 'free' hot water for sinks in the toilets.
- **Installation of solar array** – a 6.6kW solar array was incorporated within a programme of cyclical flat-roof refurbishments. The array generates 6,000kWh/pa, supplying mainly the administrative offices.
- **LED lighting rollout** – Most of the building was relamped on a phased basis between 2016-20. Spreading the project life also captured the benefit of LED panels falling in price and rising in efficiency.
- **Good housekeeping** – Installation of LEDs and membership of Eco Church gave an opportunity to create some branded awareness notices, encouraging community hall users to switch-off after activities.
- **Removal of IT server** – The IT server function was located offsite, which also enabled the removal of the A/C unit equipment. Future changes to telephony could produce further material electricity savings.
- **Getting the message out** – Since 2018 the cathedral has chosen to publish its footprint/energy spend in its annual report and a dedicated carbon footprint section has been created on its website.

How well does it work?

2019 electricity carbon emissions showed a fall of 35% compared to 2013 (net of UK electricity grid decarbonisation) demonstrating the significant impact of projects undertaken. This was a key factor in the cathedral as a whole achieving its 2013-2020 total energy carbon reduction target of 20% a year early.

The micro-CHP provides valuable baseload power, is compact and quiet running. Whilst being an 'interim technology' (still using gas) it has potential to play a longer-term role, if green hydrogen enters the gas grid.

The solar array output has exceeded forecasts. There is potential to add another small array.

Onsite electricity generation now meets 75% of electricity demand for the building and earns FIT income.

User feedback on the LED lighting has been positive, particularly in relation to the longevity of fittings.

Timing the "switch off" awareness campaign to coincide with the fitting of the better-quality lighting helped to engage with users of the community hall; the change creating a natural opportunity for engagement.

How much did it cost?

2015-19 summary:

- Total spend on projects = £32,000
- Feed-in tariff income over the period = £10,600
- Total electricity cost savings over the period = £10,500 (annual cost reduced by 44% comparing 2019 to 2013, despite the tariff rate increasing by 22% over the same period)
- Project is on-track to payback the capital expenditure within 10yrs of project start.

*"These projects demonstrated that achieving meaningful carbon emissions reductions against a background of challenging financial sustainability for cathedrals **is** possible. Transparency also stimulated wider interest in carbon reduction, which helps with mission. The CofE Net Zero Carbon by 2030 target presents a further challenge, and hopefully the experience we've gained over the last 5yrs will assist us going forward – particularly on the decarbonisation of heat, which is now 88% of our energy footprint compared with 69% in 2013."*

Richard Abraham, Chapter Clerk and Chief Operating Officer.