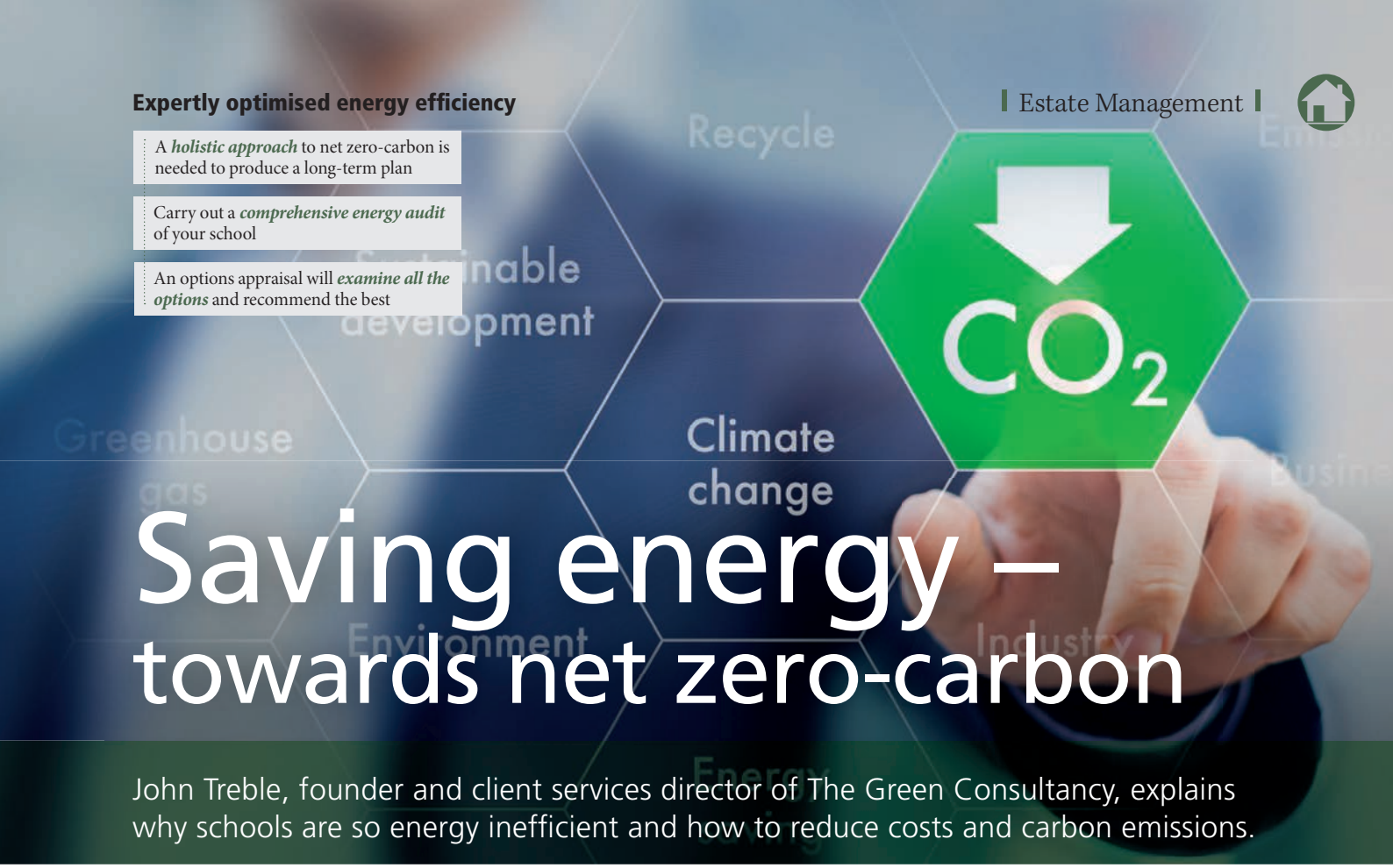
Expertly optimised energy efficiency

- A ***holistic approach*** to net zero-carbon is needed to produce a long-term plan
- Carry out a ***comprehensive energy audit*** of your school
- An options appraisal will ***examine all the options*** and recommend the best



Saving energy – towards net zero-carbon

John Treble, founder and client services director of The Green Consultancy, explains why schools are so energy inefficient and how to reduce costs and carbon emissions.

Following our presentation by Carol Somper at the February ISBA estates conference and her article in the Spring 2020 edition of the Bursar's Review, we received a number of enquiries from members about upgrading their estates to achieve net zero-carbon and reduce energy costs.

This represents a serious challenge because, typically, schools have a wide range of building types of different ages. It is also a major cost saving opportunity because most school energy infrastructure is old and inefficient. Before looking at how to go about improvements, it is worth considering how so much energy is wasted and why previous attempts at improvement may have failed.

Why is energy infrastructure so inefficient?

Over-sizing: sadly, for a variety of reasons, M&E consultants have almost universally specified over-sized (or even unnecessary) and excessively expensively equipment which can never operate efficiently during its lifetime however well it is controlled. This applies to all plant – including boilers, CHP, cooling and electrical transformers. And I'm not talking about the odd 10-20 percent but *hundreds of* percent over-sized – sometimes completely superfluous plant is installed when sufficient capacity already existed!

Poor control: the control of equipment is often very poor or effectively non-existent. Building Management Systems (BMS) have been value engineered out of the design or incorrectly specified, installed, commissioned, maintained and used – and in most cases are now also obsolete, rendering essential maintenance impossible.

New buildings: there is almost invariably a massive energy performance gap between design and delivery. In fact, according to a RIBA CIBSE database, buildings tend to consume between 1.5 and 2.5 times the amount of energy originally predicted by their designers. This is partly because modern buildings depend on more electromechanical equipment which suffers from the same range of problems listed above for BMS. More scandalous is the fact that some of the worst buildings are very highly rated by 'green' building certifications schemes such as BREEAM (Building Research Establishment's Environmental Assessment Method) and LEED (Leadership in Energy and Environmental Design).

These schemes are essentially a weighted tick box exercise and are easily misused to include technologies that are inappropriate or incompatible to increase a building's rating. This is, of course, totally counterproductive and can lead to £millions being wasted on unnecessary plant and energy consumption during the life of a building.

Whatever the 'green' rating, energy efficiency should be expertly optimised independently of the certification scheme.

Benchmarks: All published benchmarks of energy consumption in specific sectors are seriously flawed because they are based on very old or inaccurate data and don't adequately reflect the huge variations in the age and construction of buildings. They are therefore mostly too high and so actually encourage complacency and a lack of ambition for energy-saving. Display Energy Certificates (DECs) are of limited value because they incorporate some of the same flaws. However, the benchmarking of your own buildings against each other is a valuable exercise.

▲ Carry out an energy audit of the school to quantify opportunities for carbon and cost-saving

Why your previous attempts at improvement may have failed

Optimising the energy efficiency of buildings is the number one opportunity for cutting energy costs and reducing carbon emissions. Done properly, savings of the order of 20 – 50 percent can be achieved with commercially attractive paybacks. So why has this so rarely been achieved?

Admittedly, it is not easy to get right. It is essential to correctly identify and prioritise what to do, and what not to do, before making changes. Seemingly obvious solutions are often seriously suboptimal, or even make matters worse, if the underlying causes are not properly understood. Understanding the causes demands a forensic study. A 'walkthrough' survey of the sort once funded via The Carbon Trust isn't adequate.

To accurately determine where savings can be made you first have to find out what is not working efficiently, by how much and why. It is essential to ensure that any energy consultancy appointed measures the actual energy efficiencies. If they don't, they may well:

- overlook the most cost-effective opportunities for energy savings;
- recommend flawed high cost projects that will either never produce the desired effect or that will only pay for themselves over a much longer period than predicted;
- provide inadequate business cases so recommendations tend not to be implemented.

It is also important to ensure that the consultant appointed is independent and does not have a financial interest in any of the solutions they recommend. More obviously, equipment suppliers will skew business cases in their favour.

Towards net zero-carbon – your target

Net zero is a unique challenge because we only have this next decade left to limit emissions to avoid dangerous climate change. Ideally, you will develop a strategy and carbon reduction targets for your school and publicise them to your key stakeholders – which, of course, include your pupils.

Towards net zero-carbon – implementation

Moving to net zero involves ambitious reductions in energy use and there is, of course, no one-size-fits-all silver bullet – so it's a big mistake to have preconceptions about which technologies to apply to which buildings and to approach the estate in a piece-meal fashion.

A holistic approach is needed to produce a long-term plan with prioritised and phased implementation. That plan needs to be flexible because many factors affecting the cost effectiveness of solutions will change over the lifetime of the plan – factors such as changing technologies, unit energy costs and carbon taxes.

All funding options should also be considered. One of those is to use an Energy Services Company (ESCO) to provide a complete funding, implementation, and management service via an Energy Performance Contract (EPC) with guaranteed cost-savings. However, a typical simple 20-25 year EPC contract is likely to be seriously suboptimal given the need for flexibility – so expert *independent* advice is needed.

The steps

The first step is to carry out a comprehensive energy audit of the school (including site survey and analysis of all available energy consumption data) to fully understand the starting point and quantify the opportunities for carbon and cost-saving. This is as much about reducing energy loads (to reduce consumption and the size and cost of new equipment) as it is about considering technologies such as:

- renewable and decentralised energy;
- energy storage;
- electrification of heat and transport;
- hydrogen technology;
- district heating and cooling schemes; and
- the Internet of Things (IoT) and Artificial Intelligent (AI) technologies.

Next an options appraisal is needed to forensically examine all of the options and recommend the best of them (in terms of suitability, risk, and cost-effectiveness) and provide an implementation plan.

You are then likely to need professional support for design, tendering, project management and funding.

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