

## Equipment: The small things add up

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A lot of the good that can be done to improve energy efficiency in buildings through design can be undone by the equipment that is used inside.

The main problem areas are in HVAC (heating, ventilation and air conditioning), lighting, IT equipment and other appliances, says Chris Nunn, senior sustainability and energy consultant at Atkins, an engineering consultancy.

HVAC is responsible for 55 per cent of energy use in residential properties and 35 per cent in commercial properties, says Heather Daniell, energy efficiency analyst at New Energy Finance, a clean energy consultancy; while lighting, which accounts for just 4 per cent of consumption in houses, makes up 30 per cent of commercial buildings' energy usage.

HVAC can be improved drastically through building design – shading canopies to protect areas that retain the heat, such as concrete courtyards. Other simple and relatively cheap measures include “smart” windows that allow light through but block infrared and ultraviolet radiation that produces heat. “These are all quite low-tech ways of reducing demand,” says Mr Nunn.

More advanced electrochromic windows are able to turn darker and block sunlight out at the flick of a switch or in response to sunshine. Such technologies are likely to increase in popularity as temperatures rise and energy intensive air-conditioning becomes more of an issue. Although it cools the individual buildings, it also exacerbates temperatures in cities because of the waste heat the machines produce.

One technology that will have a big role to play is heat pumps and heat exchangers. Heat pumps extract latent heat from the ground, the air or water and turn it into usable heat by a process of compression and condensing. The only energy required is to run the pump – about four times the amount of heat energy is produced, according to New Energy Finance.

Heat pumps will be particularly useful in temperate climates such as Northern Europe and North America that will require both heating and cooling. Many heat pumps – which use the same technology found in refrigerators – are able to provide either heating or cooling. Heat exchangers can also transfer heat from warm areas of the building, such as IT server rooms, to other parts of a building or provide hot water.

Ice Energy, a UK-based provider of heat pumps, is taking another approach. It uses off-peak electricity to freeze water and then uses the ice to cool buildings during the day when energy is more expensive. Not only is money saved, but the company claims it also uses 30 per cent less energy than traditional air conditioning by taking advantage of milder conditions at night.

A number of companies, such as RL Tec, a provider of clean technology, are working on devices that help to shift demand from peak times by sending signals to appliances such as refrigerators and air conditioners to switch off. “Without you noticing, such demand management devices can enable the grid to do away with the need for entire power stations to be on ‘spinning reserve’ to meet short-term peaks in demand,” says Steve Mahon, chief investment officer of [Low Carbon Accelerator](#), an investor in RL Tec.

A number of countries are regulating incandescent light bulbs into obsolescence – most are being replaced by compact fluorescent lamps. These use a fifth of the energy of traditional lights, but they contain mercury, which complicates their disposal. They in turn are expected to be superseded by light emitting diode (LED) lamps, which are 10 times as efficient as incandescents, says Ms Daniell.

LED lights are expected to appear within the next year and should be much cheaper to produce because of the potential to print them on to plastic substrates in a similar process to newspaper printing.

There is also great potential for buildings to become part of the “smart grid” through the installation of building control systems. These can include equipment such as presence detection that ensures lights are only turned on when people are in the room, light sensing receptors that ensure less lighting is used near windows and smart meters that provide users with detailed information about how they are using energy. The smart grid makes it easier to sell electricity back if you generate power on-site, and to reduce usage at peak times.

One of the key elements in cutting energy use however, is in how people use the building, says Anna Halcro-Johnson, technology acceleration manager at the Carbon Trust, a UK-based government-funded body that helps businesses to reduce their carbon footprints. “Many existing buildings could use much less energy but they are not being operated correctly,” she points out. “There needs to be a cultural change in how they are used and how

energy is viewed.”

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