

Shine on

Solar panels become less efficient as they get hot, but a new generation of units that produce electricity *and* hot water while keeping the panels cool could be the answer to higher efficiency, as **Kevin McCloud** finds out

On average, every square metre of land on this planet soaks up about 250 watts of energy from the sun. On hot, sunny days it can be a kilowatt. On most days where I live in Somerset it's zero watts. But just imagine if we could power, say, the whole of Europe using direct solar energy. Arnulf Jaeger-Waldau, a scientific officer and renewable energy expert at the European Commission's Institute for Energy thinks we could; and at the Euroscience Open Forum in Barcelona last July he announced that capturing just 0.3 per cent of the sunlight falling on the Sahara and Middle Eastern deserts would do it. It doesn't sound like much, does it? And to do so would require a solar panel 'farm' about the size of Yorkshire. Except that if we covered Yorkshire in solar panels they'd produce just enough electricity to power a CCTV camera in Leeds. In the UK we urgently need fog panels. Meanwhile, the Arabs have another energy commodity they prefer to sell to us.

The Yorkshire/Sahara point is an important one, because getting electricity from the sun demands that you have some sun in the first place. Not surprisingly, Spain is one of the biggest investors and it has the two largest solar 'power stations' in the world, while countries like China and the USA are not far behind. In these places the payback on solar generated power is sensible. If you stick photovoltaic (PV) panels on your roof you're likely to recoup the cost in a few years. Here it's more like half a century. Whereas if you choose to stick a solar thermal panel on your roof to do the rather mundane job of heating your hot water - by simply passing a fluid through some vacuum tubes or even just painting

a radiator black and circulating your domestic hot water through it (my idea, you read it here first), you can recoup the cost (around £3,500) in seven to 15 years and you'll even be pre-heating that water in winter. The general consensus is that solar PV panels (the ones that produce electricity) are expensive, but that installing solar thermal (for hot water) is a no-brainer.

Ten years ago I climbed to the top of Jodrell Bank radio telescope to look at the electronics at the very focus of that giant dish - the focus being the tip of the pointy bit in the middle. The dish bounces extraordinarily faint electromagnetic signals from the far edge of the universe and concentrates them at the focus, where a collector responds to these ethereal vibrations and turns them into exciting bleeps for astronomers to coo over. The interesting thing for me was to discover that the electronics of the collector are kept at just below an unbelievably cool -272°C, a fraction of a degree off absolute zero, just to calm the electrons in the cables and circuits so that there is minimum interference from the electronics, and the intergalactic signals can be perceived.

My point? Electronics produce heat as they work (just think of your computer or laptop), but they're only efficient when they're running cool, when energy isn't wasted as electrons and atoms bounce around. And the great irony is that photovoltaic panels only really get going and start earning their keep when the sun comes out. When it gets warm, in fact. The sun's heat stimulates the electronics, which produce even more heat as they go to work, which immediately sticks the brakes on



Photovoltaic thermal (PV-T) panels

Advantages

- ◆ They produce both heat and electricity and can, given an appropriate system design, provide 100 per cent of a home's electricity and heating requirements
- ◆ A better electricity yield - typically 25 per cent more

- than standard PV panels - even in the British climate
- ◆ PV-T panels can be integrated into pitched roofs or surface mounted on a flat roof
- ◆ Installing these innovative energy producers is cheaper than installing

- separate PV and solar thermal systems
- ◆ There are no moving parts so the system is very low maintenance
- ◆ Unlike other renewable systems, such as a biomass boiler, there are no ongoing running costs

Disadvantages

- ◆ Currently cost is the major disadvantage. Being a new technology, PV-T panels are expensive, costing around 10 per cent more than normal PV panels, which can give them a longer payback period

because the electronics start to become very inefficient. It's the catch-22 in the world of silicon circuitry. But, ladies and gentlemen, this circular conundrum has just been solved.

For 170 years, since Antoine Henri Becquerel (French physicist and winner of the 1903 Nobel prize for discovering radioactivity) used selenium to experiment with photovoltaics in 1836, and for 242 years since Horace de Saussure, a Swiss aristocrat, naturalist and physicist, captured solar heat in his homemade solar box oven in 1767, the two disciplines have remained more or less separate. Until a very short while ago when a team of brilliant German physicists had the idea of putting the two technologies together. At last. Their solution, one which I wish I'd thought of years ago, was to circulate the magic water from solar thermal panels around the electronics in solar photovoltaic panels. Bingo! Two benefits: hotter water quicker from busy electronics buzzing away and producing waste heat, and electronics which are cooled in the process. The result is the PV-T panel - as used by Richard Hawkes on his arched eco home

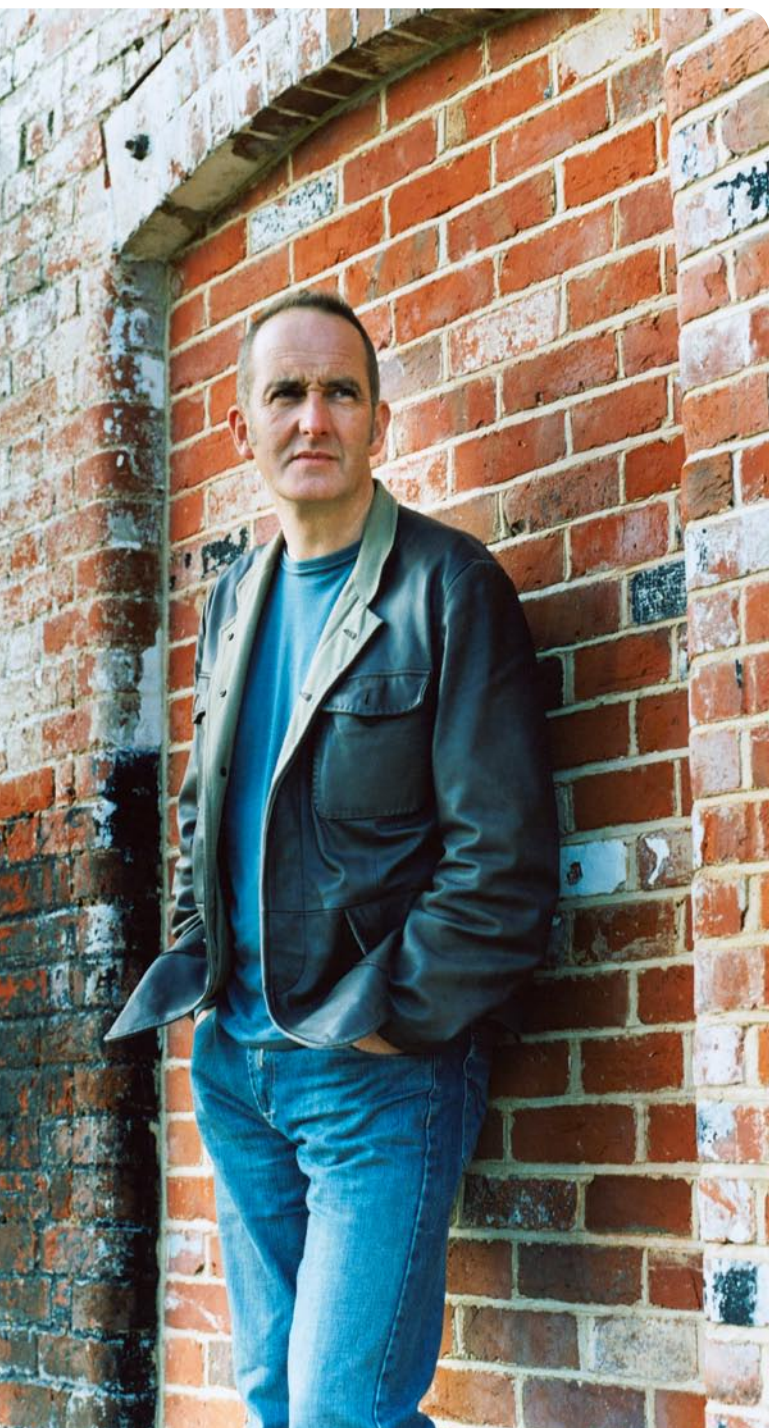
(See page 62) - from a firm called Newform Energy, which produces 25 per cent greater electricity yields than a standard photovoltaic panel.

I'm still waiting for the third (or is the seventh?) generation of photovoltaic panels that are going to be printed onto my roof tiles or embedded into my scalp. The future of this extraordinary industry is rich with promise; a recent United Nations report revealed that solar power is attracting annual new investment of \$33.5 billion dollars. And if you live in a drier, sunnier region of Britain, in East Anglia perhaps, or Bournemouth, you

might want to consider this new hybrid panel. Although the technology is so new it's not yet accredited by the Low Carbon Buildings Programme, they are aware of its existence, so do check for any grants available towards installation (lowcarbonbuildings.org.uk). And once they're fitted you can gloat about being able to sell energy back to your power supplier. The rest of us are, meanwhile, waiting for the first generation of fog-voltaic panels, or FVPs as I like to call them. ★ **Newform Energy (0845 293 7554; newformenergy.com)**

above Richard and Sophie Hawkes installed PV-T panels on their arched eco home in Kent. Though the panels are expensive to install, they have no running costs and produce enough electricity to sell the surplus back to the grid

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