

Innovation: Sunrise boulevards could bring clean power

New Scientist

With many governments now introducing [feed-in tariffs](#) [1] – financial incentives for homeowners to install sources of renewable energy – some companies are even offering to install photovoltaic (PV) cells on house roofs for free. But although solar cells are destined to become a more common sight, are rooftops really the best place for them?

Even if the government inducements work, and PV cells end up adorning large portions of the [urban skyline](#) [2], by 2020 they are expected to account for a mere 2 per cent of electricity in the UK. There may, however, be another way to enable PV cells to make a greater contribution: stick them on our roads and drive on them.

New Scientist has been talking to electrical engineer [Scott Brusaw](#) [3], based in Sagle, Idaho, who believes that replacing [asphalt](#) [4] with PV cells is the way forward for renewable energy.

With funding from the US Federal Highways Administration he has been looking at how PV cells, normally perceived as relatively fragile devices, can be toughened up to withstand the relentless pounding that trucks and other traffic would throw at them.

Homeward bound

If successful the rewards could be handsome, says Brusaw. According to figures he has obtained from the American Geophysical Union, roads, highways and open-air parking lots in the lower 48 US states account for more than 100,000 square kilometres of surface area. If this asphalt and concrete were replaced with solar cells of moderate efficiency – around 15 per cent – they would not only generate a significant amount of energy but would also provide a backbone infrastructure to deliver the energy to our doors, he says.

Brusaw's plan is to create 3.7-metre square panels – the US interstate highway system standard lane width – that slot together, linking up through junction boxes lying beneath them. With a US national average of around 4 hours of sunlight a day, each of these panels would be capable of around 7.6 kilowatt-hours of energy a day, he says. This could either be fed into the grid or stored in super capacitors or flywheels within the panels to allow electric vehicles to recharge through roadside plug-in points, he says.

Brusaw estimates that the cost of each panel would be around \$10,000, which – based on figures from the Idaho Transportation Department – he estimates to be roughly four times the current cost of laying asphalt. He hopes these panels can be

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made to last longer than conventional road surfaces, but that still makes them more expensive – until you factor in the electricity they would produce, says Brusaw. "Our panels are designed to pay for themselves," he says.

Tough cell

Perhaps, but can PV cells really be made tough enough for the job? Glass can be made to be as strong as steel, but the challenge here is to make it resistant to shattering. Brusaw is convinced it can be done, for example by borrowing tricks used to make bullet-proof and [blast-proof glass](#) [5].

One way is to deposit thin-film PV material onto flexible plastic and laminate it onto toughened glass, says materials scientist [Carlo Pantano](#) [6] at Pennsylvania State University in University Park, who Brusaw has been consulting.

However, that leaves the issue of tyre grip. "Smooth surfaces are the strongest for glass," Pantano says. That's not so great for driving on.

So some texture would need to be added, which in turn presents two problems, says Pantano. Any texturing or roughening will reduce both strength and the amount of light hitting the PV cells.

Road to nowhere?

These are issues Brusaw says he is currently trying to work out. So far, he has built only a single crude [prototype](#) [7], which houses the necessary electronic components, but is neither operational nor toughened.

One solution he is considering is to use thousands of tiny prisms built into the surface. These would allow tyres to grip and would also help to direct sunlight to the PV cells when the sun is low, he says.

While Brusaw seeks funding to build a functioning prototype, his hopes are pinned on winning a slice of the [Ecomagination Challenge](#) [8], a \$200 million prize sponsored by multinational conglomerate GE for developing the next-generation power grid, which closes at the end of September.

Little wonder. Adding truck-proof technologies and microprism textures is likely to be costly. If Brusaw is to stand a chance of pulling this off he's going to need every penny he can get.

[SOURCE](#) [9]

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