

LOG ON to the website that shows the locations of all London's charging points for electric cars, and you could be forgiven for thinking that they were almost as common as Fairtrade coffee outlets.

And you would be right: the stations — poles fitted with sockets — are becoming a familiar sight on street corners and in multistorey car parks. On the face of it, they are evidence of a 21st-century battery-powered utopia. But try to plug an electric car into many of them and it's a different story: chances are you will receive not an environmentally friendly surge of electricity but a flashing red sign telling you the charging point is out of order.

Five years after Boris Johnson, the mayor of London, promised to make the city the electric car capital of Europe with 7,500 charging points dotted around the metropolis, it has emerged that despite millions of pounds of public investment a high proportion do not work, suffer unexplained technical faults or have been installed in the wrong place, making them impossible to use.

Figures supplied to The Sunday Times show that Source London, which runs the recharging network, recorded 1,139 faults last year, affecting 355 of the 881 units. When Driving tried the network, more than half of the charging points we tested were unable to recharge an electric car adequately. And when they do fail, many remain out of action for weeks. Figures from Source London show that over a quarter of charging point faults take more than 20 days to be resolved.

Part of the problem may be that because so few drivers use the points, which are free once you have paid an annual £10 fee, the fact that many have fallen into disrepair has gone unnoticed. Last year, 378 of Source London's recharging posts (more than two in five) were not used by a single motorist.

The capital is not the only place with problems. Users of government-funded charging points in Milton Keynes and the northeast and southwest have also described repeated problems with unreliable charging points.

With Dominic Tobin from Sunday Times driving One of the main barriers to more widespread adoption of electric cars is the perceived problem of recharging them. Drivers worry about being stranded — so-called range anxiety. The fear among supporters of electric cars is that if charge points are unreliable, it may be worse than not having them in the first place.

“My view is that the current national infrastructure is not fit for purpose,” says Kevin Sharpe, a businessman from Bradford-on-Avon, Wiltshire. “It's why a number of drivers are transitioning from short-range cars to range-extended versions, which typically have a small petrol engine to charge the car on the move.”

Sharpe was so frustrated by problems with recharging his own electric car that he set up a charity, Zero Carbon World, which has built a network of free-to-use charging stations. It is one of several independent networks being set up by companies such as Tesla, Ecotricity and Chargemaster.

How hard is it to charge an electric car in Britain? We took a range-extender version of the BMW i3 on a trip across London to Bristol to find out. We tried a total of 30 charging points that were installed using some of the £67m of taxpayers' money available nationally for this purpose. At 18 of these, there was a problem that meant charging was either impossible, unreasonably slow or worked for only a short period. Another seven were blocked by non-electric cars.

Snaresbrook station, on the eastern edge of London, was typical. It's the sort of place where you might drive in and park for a £6 fee, leaving your car to charge while you take the train to work. Once the BMW was plugged in to one of the points, however, it failed to charge. The same thing happened at the next charge point, with a message on the car's dashboard saying the voltage was too low. Source London's helpline was unable to assist. One final attempt to get some charge appeared to work at first — but the car's dashboard estimated a full charge would take 19 hours, rather than the four that it should have done.

In Stratford, east London, the first on-street charging point we tried promptly declared itself out of order on its digital display, although a second point did begin charging the car. Even the vast car park at the nearby Westfield shopping centre, next to the Olympic Park, failed to deliver. The charging points had stickers with Olympic symbols on them, but each attempt resulted in a false start: a brief burst of electricity before a light around the BMW's charging socket began flashing red, indicating that something was amiss.

A multistorey car park opposite the Tower of London with 10 charging points was next. Half were ruled out because conventional cars were parked in front of them, a problem known by the electric car fraternity as being ICEd — blocked out by vehicles with internal combustion engines. Others simply failed to work.

According to Source London, reasons for charging points being inoperative can vary. Some suffer mechanical failure and must wait for new parts, others fall victim to utility repairs that shut off the electricity supply. Some rely on a mobile phone signal to verify the driver has paid the annual fee; if they are installed in an underground car park, for example, where reception is patchy, this can mean they don't function.

The organisation says the charge points are owned by its partners, which include car park operators and public bodies. It says they should have agreements to maintain the charging points and that it is working on solving the mobile phone problem.

Are publicly funded charging points any more reliable elsewhere? In 2010 the Department for Transport (DfT) awarded the first of a series of grants, worth £30m, under its Plugged-in-Places programme designed to create a national charging network. So far, £17m of that has been used in areas from Northumberland to Norfolk and the DfT has made another £37m available for electric infrastructure projects.

In addition, local authorities have taken advantage of other grants. Bristol was awarded almost £100,000 from the local sustainable transport fund and, more recently, won £562,200 to install rapid chargers. Recent figures suggest that the network, called Source West, is rarely used: in 2012 there were just 14 users of 36 charging points.

As in London, finding the recharging points in Bristol is easy, via an online map. But while the first two attempts worked well, by the third a familiar pattern was emerging: a lack of power. And that's if the promised charge point is there at all: one of the final sites, next to Temple Meads station, was no more than a wire protruding from the ground.

The irony is that the unreliability of the charging network is emerging as car makers report rising interest in their vehicles. After years of disappointing sales, electric cars appear to be slowly winning over buyers. New, stylish models such as the BMW i3 and Tesla Model S have joined the market alongside well-regarded cars such as the Nissan Leaf, Renault Zoe and Volkswagen e-Up!. Last month sales of pure electric cars rose to 823: a rise of more than 200% over the same month in 2013. But if new owners can't recharge, the uptake risks being choked off just when it appears to be getting going.

## **Look — no wires**

Plug-in charging points may be suffering glitches but the Highways Agency is working on plans to test wireless technology that could make them as redundant as the typewriter and cassette Walkman.

The agency, which operates Britain's motorway and trunk roads, is drawing up an initial specification for a system of charging pads that can be placed underneath the road surface. When a car with a receiving pad passes over each one, an electromagnetic field is generated and energy transfers to the vehicle. A network of pads could provide a continuous supply of energy, eliminating range anxiety.

The technology will not be trialled for at least two years. The Highways Agency says that it will need to be developed to withstand constant pummelling by lorries, as well as the wind, rain, ice and snow of a British winter, for up to 16 years, after which the pads would be replaced at the same time as the road surface.

By that time, electric racing cars in the new Formula E championship, which begins later this year, are expected to be using wireless charging to keep their battery levels up during races. However, it is buses that are leading the way: electric buses in Milton Keynes already charge their batteries wirelessly while parked at each end of their route. Some in London will begin doing so within a year.

Ben Webster

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Hundreds of subsidised electric car charging units are going unused for long periods and wasting valuable parking spaces, according to research by the RAC Foundation.

Almost two thirds (64 per cent) of the 905 charging units in London were not used at all in June despite a quadrupling in registrations of electric cars.

More than half the units, installed at a cost of more than £9million to the taxpayer, were not used in either June 2013 or June 2014, according to Transport for London data released under the Freedom of Information Act. The most heavily used units were in the congestion charge zone, in which electric cars are exempt from the £11.50 daily charge.

Professor Stephen Glaister, director of the RAC Foundation, said the low usage should prompt a review of plans to install thousands more units in the next three years. “The medium-term aim should be to encourage home, off-street and workplace charging, not turning valuable kerb space over to probably wealthy electric vehicle drivers so they can enjoy the benefits of cheap or free fuel and parking,” he said.

A spokeswoman for Boris Johnson said the mayor of London wanted to “support a dramatic shift towards more environmentally friendly vehicles”, adding that the extra charging points could also support fleets of electric taxis and car clubs.

## **Cutting emissions is going to bankrupt us**

**Matt Ridley**

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We can't rely on nuclear or renewables, so we've pinned our hopes on carbon capture – but that's not working either

Carbon dioxide is not the most urgent problem facing humanity, compared with war, extremism, poverty and disease. But most presidents, popes and film stars think it is, so I must be wrong. For the purposes of this article let's assume they are right. What's the best way of solving the problem?

Whichever party wins the election will be legally committed to cutting our carbon dioxide emissions by 80 per cent by 2050. About 90 per cent of Britain's total energy still comes from fossil fuels and bio-energy, both of which produce carbon dioxide. The expansion of nuclear, wind and solar is

not going nearly fast enough, because electricity comprises just one third of our energy use. If we are to decarbonise transport and heating too, we will have to switch to electric cars, and electric radiators, which means generating three times as much electricity. Only aeroplanes would be left using fossil fuels.

Leave aside for now the problem of the intermittency of renewables: how to charge your car, or cook on your electric hob when the wind is not blowing and the sun is not shining. Also, the rest of the world is not following suit: fossil fuel use is growing rapidly and maintaining market share. The concentration of carbon dioxide in the atmosphere, as measured on a Hawaiian mountain top, is climbing relentlessly.

The science and technology committee of the House of Lords (on which I sit) told the government last week in a report on the resilience of the electricity system that it has not sufficiently informed the public about the “trilemma” facing policymakers. We cannot — in the present state of technology — make the electricity supply low-carbon, resilient and low-cost all at the same time. Decarbonisation is not achievable if politicians wish to restrain energy prices.

Which leaves plan B: to continue using fossil fuels but extract the carbon dioxide from power station exhaust by “carbon capture and storage” (CCS). The Energy Technology Institute told our committee that CCS is the only way to keep the cost of decarbonisation from raising energy prices by an extra £10 billion a year by 2030 and “several tens of billions a year” by 2050.

When the topic of CCS comes up, I admit to being unsure whom to believe. On the one hand there are those who say: it is ready to go, it solves the problem, what are we waiting for? On the other, those who say it’s a costly white elephant going nowhere.

My own self-interest as a landlord of a Northumbrian coal producer would suggest that I should be in the first category, because it’s a get-out-of-jail-free card for the fossil-fuel industry. If CCS were to work, then we could press ahead with fossil fuels and stop worrying. But I’m not convinced it will do the trick.

It is technically possible to extract CO<sub>2</sub> from an exhaust stream. The recipe is as follows: bubble the exhaust gases through a caustic brew of chemicals called amines, which grab the CO<sub>2</sub>. Then place the brew back on the stove, bring the heat up to 120C and the CO<sub>2</sub> fizzes back off again. Capture it and inject safely into an oil well to enhance the recovery of more oil, or store it underground. Save the caustic brew and re-use.

The first problem is that the process reduces the efficiency of the power station. A normal coal-fired power station runs at about 35 per cent efficiency — that is to say, a bit more than a third of the heat energy in the steam gets turned into electricity. Adding CCS means that the efficiency drops to maybe 26 per cent. The cost correspondingly goes up substantially, as do people’s

electricity bills: according to the industry, it would roughly treble the price to about the same as power from an offshore wind farm.

The biggest working demonstration of CCS began operating last October in Saskatchewan in Canada, where SaskPower says its new coal-fired plant is exceeding expectations, generating about 160 megawatts, 40 of which are used to capture the carbon dioxide, leaving about 120 megawatts for the grid. The 2,300 tonnes a day of captured carbon dioxide are 99 per cent pure and are used to enhance recovery of oil near by. But this is a small unit by coal-fired power station standards and only pays because the nearby oil industry is prepared to buy the CO<sub>2</sub>.

Nor is it without risks, so the greens are against it, though they would be anyway because they hate the idea of fossil fuels getting a new lease of life. Injecting huge quantities of carbon dioxide into the ground risks causing small earthquakes, and possible leakage, with the (remote) potential to suffocate a nearby town.

The British government has been dangling a £1 billion carrot in front of the energy industry to get CCS going. A few years ago, Eon and Scottish Power both dropped out. Then last year two projects signed contracts, one in Yorkshire, and one in Peterhead in Scotland. In the latter case, SSE, the energy company, and Shell propose to pump the CO<sub>2</sub> out under the North Sea, not to help to enhance the recovery of oil but to justify putting off the decommissioning of an oil platform called Goldeneye.

Similar delays and cancellations are affecting CCS around the world. Whereas the United Nations once forecast that at least 20 large-scale demonstration plants would be on line by 2020, in practice there will be none. Given that electricity is only a small part of the energy system, if CCS is to solve our problems it has to roll out to not just every coal and gas power station on the planet, but to three times as many — once we have electrified heat and transport.

However, all is not lost. Last week scientists at the University of California, Berkeley, announced the discovery of a new class of compounds that scrub carbon dioxide from exhaust much more cheaply. Called diamine-appended metal-organic-frameworks, they require only half as much heating as the conventional process. Another team at Lawrence Livermore Laboratory, also in California, is getting good results with microcapsules of baking soda. In other words, it is possible that chemists will come up with something much cheaper — but it will take time to find out if such ideas can be scaled up efficiently.

For now, though, there is no way to meet our self-imposed decarbonisation target without bankrupting the country. It's not more effort and political will we need; it's more research.