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Transport

Electric roads to charge your car as you drive

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by Joanna Roberts



Electric roads could charge cars while they're on the go, or waiting at a traffic light. Image courtesy of Pixabay/stuart150

Plugging your electric car into a charging station could become a thing of the past as researchers are developing electric roads that can charge your car while waiting at a traffic light or even on the move.

It's part of a series of projects looking at improving the infrastructure for electric vehicles to encourage people to invest in electric transport and reduce emissions.

One of the obstacles to the popularity of electric vehicles is so-called range anxiety – the worry about how far you can travel before your battery runs out. Wireless charging could change all that.

'Going to wireless charging, either stationary or dynamic, then you forget all the problems with range,' said Dr Angelos Amditis, at the Institute of Communication and Computer Systems in Athens, Greece.

Dr Amditis coordinates the EU-funded FABRIC project, which is looking into the feasibility of wireless, or inductive, charging for electric vehicles.

This works by having a cable or charging hub buried in the asphalt, and a coil on the underside of the vehicle. When the vehicle is in the vicinity of the charging hub, it wirelessly connects and begins to charge.

So-called static charging is done when your car is parked, for example in your garage overnight. Stationary charging is done in short bursts, for example at traffic lights or tolls, while dynamic charging keeps your car fully powered while it is on the move via induction loops under the road surface.



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Greece



‘The most advanced method is when you are really driving, for example on the highway,’ said Dr Amditis. ‘One of the lanes is equipped, and then when you are travelling you are getting some charging.’

FABRIC researchers are coming up with a plan to define which solutions are most suitable in which circumstances. For example, stationary charging may be suitable to use in cities whereas dynamic makes more sense on highways.

However, both stationary and dynamic charging have technical challenges to overcome before they get to market, according to Axel Barkow from the EU-funded UNPLUGGED project, not least that more development needs to be done on fast-charging batteries.

‘There are still scenarios where you will need a cable. Nowadays, when we talk about fast charging or ultra-fast charging, there is not a technology in sight which might be wireless.’

Static charging

However, he says that progress is more advanced with static charging, which happens when a car is parked. ‘In terms of the static scenario, I think this is something that will be on the market very, very soon.’

The UNPLUGGED project built two demo vehicles - a passenger car and a delivery vehicle - to investigate how inductive static charging could work in practice. Barkow says that one of the main obstacles standing in the way of wide rollout is the lack of an industry-wide standard for the chargers.

‘There is not yet a final standard defined which can be used,’ he said. While this is not necessarily a problem for private cars, it is for other vehicles.

‘In your garage it’s very unlikely that a car other than your own will charge on your charging pad. (But) putting things into public infrastructure, things look very different.’

Michael Glotz-Richter, a sustainable mobility project manager with the City of Bremen, Germany, coordinates the EU-funded ELIPTIC project, which is looking at the electrification of public transport.

He says that public transport has a huge role to play in electrification. ‘When we talk about electrification, or electric mobility, we need to understand mobility as a wider thing and not only cars.

‘An articulated bus consumes, per year, 40 000 litres of diesel. When you compare it with the approach of electrifying cars, you can say that electrification of one of these big buses is having impacts like electrifying 100

cars.’

The ELIPTIC project is looking to make public transport infrastructure more efficient. One idea is to install a system that can use excess energy from tram systems to power buses using a sub-station or by directly connecting to existing overhead lines.



They are also working on a way to use a flywheel to store the excess energy created from electric brakes on trams, and how to connect the electricity supplies of trams, trolley buses and metro lines.

However, Glotz-Richter says that for electrification to have a positive environmental impact beyond reducing air pollution, you also need to look at the energy source. The constantly increasing production of renewable energy in the EU, which replaces more carbon-intensive sources, is the key to fully decarbonising transport and solving air quality problems at the same time.

Rolling out green mobility

Electric transport has been touted as a tool in moving towards a low-carbon economy and contributing to the goals agreed at the COP21 climate change conference to limit warming to 1.5 degrees above pre-industrial levels. However, researchers say that without also being part of a wider change in the way we think about transport, the effect will be minimal.

‘Electric mobility is one part of the solution but it needs to be integrated in a wider “avoid, shift, improve” context,’ said Oliver Lah, from the Wuppertal Institute in Berlin, Germany. ‘We have to first avoid all the unnecessary travel

(and then) shift over to low-carbon mobility modes that are sustainable in a much broader sense than electric cars. For the last few remaining vehicles we will have to think first about how many wheels they actually need, and then, for the very few remaining cars, these will need to be electric to get to a 1.5 (degree) stabilisation pathway.'

He coordinates the EU-funded SOLUTIONS project which aims to increase the rollout of sustainable mobility solutions by sharing best practice between cities and countries around the world. The project also developed the Urban Electric Mobility Initiative (UEMI) in cooperation with UN-Habitat, which aims to integrate e-mobility solutions into a wider sustainable transport concept. He says that some solutions, such as the high tax Norway puts on non-electric cars, are effective but would be politically difficult in other places.

'The concept of taxing something that is harmful to society and redistributing that (to something that) is beneficial to society – public transport, walking, cycling and then e-mobility – is a very sensible approach. (But) it's politically a huge effort to get a concept like that into the system.'

More info at www.urban-mobility-solutions.eu

More info

FABRIC

UNPLUGGED

ELIPTIC