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Electric Roads Could Be a Path to a Driverless Future

By Clifford Krauss

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BEIT YANNAI, Israel — Electric vehicles can significantly reduce greenhouse gas emissions, at least in theory. But challenges to wide acceptance remain significant: Batteries are expensive, charging stations are few and far between, and recharging takes far more time than a fill-up at the pump.

A technological breakthrough is needed, and many companies are working on ways to make charging faster and travel range longer. Advances have been frustratingly slow.

A small Israeli start-up called [Electreon](#) has another idea: electrify the roads to recharge vehicles as they are driven.

At its test site on a boarding school campus outside Tel Aviv, the company has placed copper coils under 900 feet of circular pavement that transmit recharging wireless energy to an electric Renault Zoe test car as it drives by.

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Since there are countless miles of road around the world, Electreon is aiming to electrify urban bus and shuttle routes first, in an effort to clean Israel's city air and reduce the country's dependence on imported oil.

Over time, Electreon executives hope to go global and make "all-electric city transport" the wave of the future.

"This project has the potential to move the electrification revolution to mass implementation," said Noam Ilan, a company co-founder and vice president for business development.

But first Electreon is taking baby steps with two separate pilot projects planned.

The city of Tel Aviv and the local, private [Dan bus](#) company are planning to deploy a mile of electrified road at the end of the year and gradually expand deployment of the coils to specified lanes around the city for buses, trucks and eventually autonomous cars. The Israeli Ministry of Transportation has granted \$2 million in seed money for the project, while Dan has contributed an electric bus and invested \$3.3 million in Electreon.

Sweden is planning a similar project on the Baltic Sea island of Gotland using Electreon technology to recharge an airport shuttle bus supplied by Dan and an electric truck at a cost of \$12 million, mostly financed by the Swedish government. The test will be an initial step in Sweden's plans to eventually build more than a thousand miles of electrified high-speed highways at a cost of \$3 billion.

The announcement in May that it had won the Swedish bid gave Electreon new credibility since the Israeli company beat out Alstom and Volvo, two global heavyweights, which offered different technological solutions.

Electreon's early triumph in Sweden was particularly sweet given that a handful of other companies had previously attempted charging on test tracks, particularly in South Korea, but with little success. Up to now, wireless charging has been mostly limited to parked vehicles.

Electric cars are becoming more popular around the world. But battery-charged buses have barely made a dent in the global market outside of China, which has developed a large fleet with government subsidies and other incentives. There are only a few hundred electric buses operating in the United States, although China and Europe are further along. Worldwide, electric trucks are even further behind.

If proven to be economically viable, Electreon could revolutionize urban public transportation. The company's "smart roads" concept entails recharging vehicles by transmitting wireless energy from the coils through the pavement and into lightweight receivers placed below the chassis of buses, which operate on fixed routes, and then delivery trucks and other vehicles.

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A charging receiver attached to the back of a car at the Electreon test site. Credit: Tamir Kalifa for The New York Times

[Frost and Sullivan](#), an international consultancy, has predicted that Electreon could install electrified roads in more than 150 locations in Israel and Europe by 2025. The consultancy views great environmental potential for a technology like Electreon's, noting in one study that nearly two-thirds of all vehicle travel happens in cities and nearly a quarter of all carbon emissions comes from transportation.

The Electreon system will require vehicles with batteries, but the batteries can be far smaller and lighter because the vehicles will constantly recharge and therefore will need minimal storage capacity.

Executives say roads can be easily retrofitted, and nearly two-thirds of a mile of road can be outfitted during a night construction shift.

An asphalt scraper digs a shallow trench in the road, while a second vehicle installs the charging strips and covers them with fresh asphalt. Power is delivered to the road from the electricity grid by power inverters installed on the sides of the road.

Once the strips are deployed, roads would rarely if ever need to be dug up for repairs, Mr. Ilan said.

Electric buses could be made more economical because the five-ton batteries for electric buses can cost \$250,000 or more, a big expense for a city like Tel Aviv that has more than 1,000 buses.

Israeli officials are intrigued, though not entirely convinced.

"I don't think the technology is 100 percent proven yet," said [Ofer Bloch, president of Israel Electric](#), the state-owned power utility. But he added, "They are doing something that might work someday."

Electreon was founded in 2013 by a couple of engineers from Elbit Systems, a prominent Israeli aerospace company with global operations, and has roughly 20 employees. Their lab is decidedly makeshift, with the look of a high school electronics lab. The charging apparatus for the test track is rigged to the back of a car using a Thule bike rack and metal rods. Surf boards lean against the walls for breaks at a nearby Mediterranean beach.

Noam Ilan, a co-founder and vice president for business development of Electreon. "This project has the potential to move the electrification revolution to mass implementation," he said. Credit Tamir Kalifa for The New York Times

Mr. Ilan said such breaks spark creativity. He insists that Electreon has an almost limitless potential revenue stream from tolls on its roads and systems to bill registered vehicle customers for the electricity they use. Revenues would likely be shared with local utilities, he said.

Michael Webber, an energy expert at the University of Texas at Austin, cautioned that a major breakthrough in battery technology could overshadow Electreon's efforts. And he said the Electreon system will have to prove to be more economical, cleaner and higher performing than buses that run on compressed natural gas or electrified buses that operate with overhead recharging wires that already operate in Seattle, Berlin and many other cities.

"We have to see, maybe it will be better," Mr. Webber added. "I give Israel and Sweden credit for dabbling in this."

Mr. Ilan said his system was superior to compressed natural gas because gas is a fossil fuel that emits greenhouse gases. And overhead recharging wires, while workable like traditional trolleys, “have a serious visual impact that no one wants anymore,” he said.

“The future for us is autonomous shuttles and trucks with tiny batteries, no driver and 24-7 operations,” Mr. Ilan said. “Drivers are going to disappear.”

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