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We have all heard of electric cars, but not of electric roads. Driving an electric car has many advantages. It is 100 percent emission-free so it promotes clean air and costs less than fueling a regular car, the need to charge it often is a major drawback. Electric vehicles batteries are heavy, expensive and can't produce enough power for long distances.

Rather than simply attempting to solve this problem with larger, heavier batteries or by adding more charging stations, Israeli startup ElectRoad is taking a novel approach by creating special roads that charge your car while you drive over them.

The company was founded in 2013 to revolutionize E-mobility with the ultimate goal of eliminating the dependency on oil. ElectRoad takes a different approach in dealing with this challenge by developing a unique technology that powers the vehicle wirelessly from the road while driving [1].

The idea comes from a couple of basic laws of physics, changing an electric current creates a changing magnetic field. Put that changing magnetic field near a wire and it will induce an electric current in the wire. So electricity moving through a coil of wire can induce a current in a nearby coil even without a physical connection.

The main advantages of this technology are: no need for charging, zero emission and minimum energy needed due to minimum vehicle weight; low cost in terms of maintenance; easy to implement; radiation is minimized and locally shielded

for driver and passenger safety. The technology will lower the cost of fuelling public transportation fleets while helping the environment.

So, how does it work? The smart road is designed to give the vehicles enough energy to power them, as well as to charge their batteries.

According to the Electroad's CEO Oren Ezer the electricity will come from renewable energy transferred to the road. A battery for an electric bus can cost \$300,000 and weigh 5 tons. If you remove the battery then the bus is much lighter and requires less energy. This technology is cost saving. If you compare it to diesel buses, it's half the price. Payback is very fast.

Powered coils beneath the road would accomplish this by inducing a current in coils attached to the bottom of the car. There are several challenges with this approach. One is an efficient way to embed and power the coils beneath the road, the other is alignment with the coils on the cars for maximum efficiency.

Another is the amount of energy that must be transferred during the brief moments the car passes over the coils. Electroad explains that the coils are switched on and off dynamically so that they don't waste energy when cars aren't nearby.

According to Ezer the technology is flexible. Only copper and rubber are needed, and deployment is quick and easy. You can retrofit one kilometer of road in just half a day, from night to morning. The installation process begins with an asphalt scraper that digs an 8-centimeter-deep trench. A second vehicle installs the wireless energy charging strips and fills the trench back up with asphalt. Smart inverters with real-time communication are installed on the sides of the road. A coil unit attached beneath the electric vehicle receives power transferred over a small 24-centimeter air gap [2].

ElectRoad is initially targeting the public transit market. According to the company, a bus will be able to travel for up to 5 kilometers (3 miles) on a regular road after being charged on the electric road. In many European city centers, buses use special lanes. These lanes could then be fitted with ElectRoad's technology to become smart electrical charging lanes for electric public transportation vehicles.

ElectRoad hopes to enter the market using infrastructure contractors and bus companies which work on transportation projects with local authorities across Europe. The company says there are as many as one million buses operating in Europe, with a stock replacement rate of 6%, or about 60,000 buses per year, meaning that the companies can pay back their investment within three years for the average electrified road, as new buses adapted to the technology are introduced.

The team has already performed successful tests of the technology, and will be demoing the electric roads on a larger scale with a public bus route in Tel-Aviv.

It must be added that ElectRoad can actually power a vehicle in real time, enabling electric cars to have smaller batteries, thereby making them less expensive and lighter [3].

References:

1. Mode of access:

<https://electroad.me/>. – Date of access: 15.03.2017

2. Mode of access:

<http://jewishbusinessnews.com/2016/05/26/israeli-startup-is-testing-out-the-countrys-first-electric-road-in-tel-aviv/>. – Date of access: 20.03.2017

3. Mode of access:

<http://nocamels.com/2017/01/electroad-electric-car-wirelessly-charge-smart-road/>. – Date of access: 21.03.2017