

Powering mobility's future: An interview with WiTricity's Alex Gruzen

A leader at the forefront of wireless electricity explains why cars are going electric, electric is going wireless, and the mobility ecosystem is headed for major change.

If the future of mobility is destined to be electric, CEO Alex Gruzen of WiTricity wants to make sure it's cordless, too. WiTricity, a Massachusetts-based start-up, designs systems that deliver power wirelessly to car batteries using a technology known as magnetic resonance.

In this interview with McKinsey's David Schwartz, Gruzen describes how convenient wireless charging could eliminate one of the major obstacles to widespread adoption of electric vehicles (EVs): the worry that consumers have about when and where to recharge the car. Solving that problem might be the key to unlocking EV sales, especially in cities. And rising sales of EVs would, in turn, usher in a host of changes for the auto industry, including the prospect of electric mobility as a service.

The Quarterly: *Alex, tell us about WiTricity.*

Alex Gruzen: WiTricity was founded in 2007, based on innovations by an MIT [Massachusetts Institute of Technology] physics professor, Marin Soljačić.

He invented a compelling way to efficiently move electricity across a distance without wires. This technology is called magnetic resonance, and, at first, the target market was anything that had a power cord and anything that had a battery. Over the past ten years, WiTricity has been doing work for Fortune 100 companies across sectors like medical devices, consumer electronics, industrial applications, and the automotive space.

The question we always faced was, “Where should we focus?” What became very, very clear was that our ability to move many kilowatts of power from a pad on the floor of your garage—or even embedded in the ground—to your car could solve some major challenges for automakers. But it wasn’t clear how big and how fast the EV market was going to grow.

Over the past two or three years, however, it’s been a sea change. Every automaker has accelerated road maps for the electrification of their vehicles. It’s been a dramatic change across the whole industry. There’s a recognition that the automobile is going through massive transformation.

The Quarterly: *What’s driving that change?*

Alex Gruzen: When it comes to electrification, some significant shifts are enabling this. One is rapidly plunging battery costs. With lower-cost batteries, you can add more capacity—which means more range. Right there, two of the major barriers repelling potential electric-vehicle buyers have improved dramatically.

Another shift is that automakers have realized that they are not going to reach their own or their government’s carbon-reduction goals by diesel or even by hybridization. So they have had to commit to electrification.

Finally, Tesla has shown the world that a fun, beautifully designed vehicle with sufficient range is very appealing to buyers. From a marketing-and-product point of view, that’s huge. If you look at market-share data within the premium category, Tesla has been very successful in taking customers away from traditional global premium brands. I don’t see any reason why this shift to electric won’t continue as costs decline and more attractive mainstream vehicles come to market.

Electric vehicles are now the single largest consumer of battery-watt hours. EVs have surpassed cell phones and all consumer electronics. That’s kind of remarkable, given the billions of phones sold every year.

So a year and a half ago, we shifted our complete focus to electric-vehicle charging. And this summer, we hit a major milestone: for the first time, a global automaker, BMW, launched a plug-in hybrid car featuring our wireless-charging technology. We expect to launch with many other global automakers in the coming years.

The Quarterly: *What's your perspective on how consumer demand will play out?*

Alex Gruzen: Current EV buyers are the early adopters. They have been very motivated, largely for environmental reasons.

But we're still at single-digit penetration in the market. We need to reach a broad cross-section of customers. And there are barriers. Number one is cost. Number two is the range the car can travel—can I get there from here? Number three is anxiety about charging.

Right now, charging requires a change in consumer behavior—remembering to charge it, plugging it in, searching for charging locations, and so on. With gasoline vehicles, on the other hand, you can be completely reactive. I drive until I'm nearly empty; the light comes on or the dashboard beeps at me; I find a handy gas station, and in five minutes, I'm on my way. I don't have to think about filling up again for maybe a week.

With electric vehicles, you have to be proactive. In the morning, you have to think: Do I have enough range? Can I get to all the places I need to go today? What about detours? What about having to go somewhere in an emergency? That's very proactive planning. It's a totally different consumer experience. And, from our conversations with automakers, the sense is that the best way to eliminate this anxiety about charging is to make sure that drivers start every day with a full battery.

The Quarterly: *Which is where wireless fits in?*

Alex Gruzen: Exactly. With wireless charging, you just park your car, and it just starts charging. A charger that you might keep in your garage delivers the power to your car battery overnight or in two or three hours between trips. It happens in the background—it's transparent to the user. You don't have to think about it. And that makes for a fantastic customer experience.

The Quarterly: *Does that mean the need to build charging stations may not be a major constraint after all?*

Alex Gruzen: Plugging in will still be part of the experience. But only for long-distance driving. When you need to go from Los Angeles to San Francisco, or Boston to Washington, DC, say, you would hit fast-charging locations along those highway corridors. This kind of "DC [direct current] charging," as we call it, is a range extender critical for long drives to grandma's house or for a business trip. But 90-plus percent of driving is done locally, by people driving less than a couple hundred miles in a day.

The Quarterly: *Does the charge-overnight model work in places like Europe and China, where the percentage of owners with their own parking spaces is much lower than in a market like the United States?*

Alex Gruzen: The model doesn't really change. The idea that I'm going to make an appointment to queue up and wait my turn to charge at a finite number of charging stations just doesn't translate to an attractive user experience. It reminds me of the early 1970s when we had even- and odd-numbered license-plate numbers determining what day you could go to the gas station to wait three hours in line for a full tank of gas. That's just not an attractive vision of the future. People will want to charge where they park, at work or at home.

More than 90 percent of charging is going to be around 11 kilowatts or less. These kinds of charges can be delivered in parking lots and parking garages and in people's homes and driveways. In China, it will be the parking garages and lots that are attached to apartment buildings. In fact, these chargers can even be embedded in the pavement. That's something we're working on.

The Quarterly: *Cities around the world are encouraging electrification. Do you think they will be a major enabler of wireless charging?*

Alex Gruzen: I think that is still some years ahead of us. As an industry, it's clear that the first vehicles coming to market with wireless charging are being sold with a charger that you would place in your driveway or put in your garage. The use case of a suburban home with a garage or driveway presents a simpler solution when deciding to buy an electric vehicle. That's how it begins. We have to have vehicles in the market for a couple of years before I would expect to see broad deployment of public infrastructure.

But I absolutely do see wireless charging ultimately being an enabler of broad urban deployment. I don't think that the urban customer has really been addressed yet.



“When there’s downtime between rides, the cars will pull over to a wireless-charging spot, top up, and then continue to provide rides. I call it ‘power snacking.’”

There are still a lot of barriers for the urban resident thinking about the choice to buy an electric car—fundamentally, where do I charge, and how do I charge? Again, you can embed the chargers in the pavement. So you can have very clean city streets and sidewalks, with no cable clutter, and no opportunity for vandalism, because the charging is embedded in the parking spots. It’s really very convenient, without having a negative impact on the urban environment.

The Quarterly: *How does electrification tie in with autonomous vehicles [AVs]?*

Alex Gruzen: At first, wireless chargers will be sold to car buyers who can put them next to a parking spot of their own. In four or five years, you’ll start to see charging embedded in urban parking spots. This will be critical to the future of mobility, since robo-taxis will eventually dominate the passenger-miles in the urban environment. And there’s no one to plug in those robo-taxis. These mobility-as-a-service companies are going to need broadly deployed wireless charging so the autonomous vehicles can extend their range and never leave their service area. When there’s downtime between rides, the cars will pull over to a wireless-charging spot, top up, and then continue to provide rides. I call it “power snacking.”

The Quarterly: *Is there a risk that automakers will want their own proprietary solutions?*

Alex Gruzen: One of the first automakers to visit our company was Toyota. Ultimately, they ended up licensing our technology. And they were very explicit that the investment didn’t come with any strings attached. They wanted it to be broadly adopted by all automakers. They want us to enable their tier-one suppliers with our technology, to deliver a ready-to-go kit. Clearly, it takes a wide variety of partners. For us, they could include ridesharing partners, AV partners, and utility companies.

The goal for the many participants in this ecosystem is a global standard. For seven years, we’ve been working with all the automakers and the SAE [Society



Alex Gruzen

Alex Gruzen is the CEO of WiTricity, an industry pioneer in wireless power transfer over distance. Before joining

WiTricity, he cofounded Texas-based Corsa Ventures, where he focused on building leading technology companies via early-stage investments. Prior to launching Corsa, Gruzen was the senior vice president of the Consumer and Small and Medium Business Product Group at Dell and previously led the company's global notebook-computer business. His experience also includes leadership roles at Hewlett-Packard, Compaq, and Sony. Gruzen holds an MBA from Harvard Business School and an MS and a BS in aeronautical and astronautical engineering from the Massachusetts Institute of Technology (MIT).

of Automotive Engineers] on a standard built around our technology to ensure interoperability. If I put a charger in my garage, I want it to work on my car as well as my spouse's, regardless of the brand. That's intuitive and obvious.

That standard must adequately address the many user requirements. You have to be able to build one charger that could work for any vehicle. It has to be able to tolerate "offset" in your parking—you can't guarantee that I'll park at exactly the right spot every single time. It must be able to be embedded in the ground. It must be impervious to snow and ice and dust and dirt and mud and anything that could get in the way. It has to be efficient. And it has to deliver a full charge.

The Quarterly: *And, of course, it has to be affordable.*

Alex Gruzen: Yes. An underrepresented part of that story is how dramatically costs drop when you electrify the vehicle: fewer moving parts, more reliable, no oil changes, operating costs plummet. When you shift to electric shared autonomy, costs will go from something like \$1.30 or \$1.40 per mile to under 20 cents, all costs in.

The Quarterly: *So electrification will be about more than just reducing emissions?*

Alex Gruzen: Electric mobility is going to be transformational. So much of the profits of an auto dealership, for instance, come from warranty work and repair

work. But what if you never have to go to the dealership? People underestimate the impact of Tesla's direct-sales model. There's lots of transformation taking place in thinking about how cars are sold. There's a lot of action around subscriptions, as opposed to purchase or lease. These dealerships may have to reshape themselves—perhaps consolidate to be more regional.

There's transformation taking place in every link on the automotive industry's value chain. There's going to be a big shift from petroleum to electricity and, in electricity, a shift from selling power to providing services. Think about this: How many dollars will be available for the sale of electricity for charging vehicles? The money will shift from petroleum companies to the electricity companies, but it will be a fraction of the total dollars that were spent on petroleum.

When you acknowledge that, it's interesting how fast the conversation shifts from reselling power with a markup to selling services. You get new ideas, like bidirectional power, or what we call “vehicle to grid,” where cars contribute power back to the grid as needed. This electric autonomous future is going to need a very, very interesting mix of software, services, and subscriptions. It's a great space to be working in right now.

Alex Gruzen is the CEO of WiTricity. This interview was conducted by **David Schwartz**, a member of McKinsey Publishing, who is based in McKinsey's Stamford office.

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